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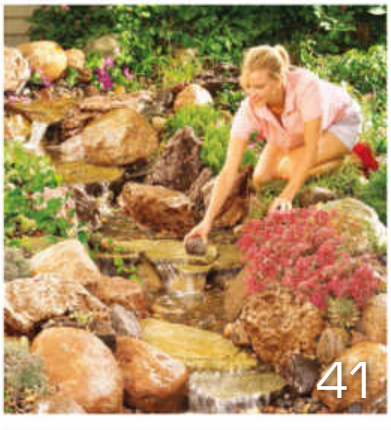

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STUFF we love

BY MARK PETERSEN editors@thefamilyhandyman.com

A waterproof outdoor kitchen

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The panels are PVC (available in five colors), and the hardware is all stainless, making the entire collection 100 percent waterproof. A base cabinet with one drawer and one door costs $998. That's not cheap, but impressing your friends and neighbors rarely is. For more info, go to trexoutdoorstorage.com.

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Power where it's needed

Nobody plans for an electrical outlet when designing and building a deck. After all, there's usually one on the wall right next to the door. But what if you want to plug something in near the outer edge of the deck? You could run an extension cord and hope nobody trips over it, or you could check out this new product.

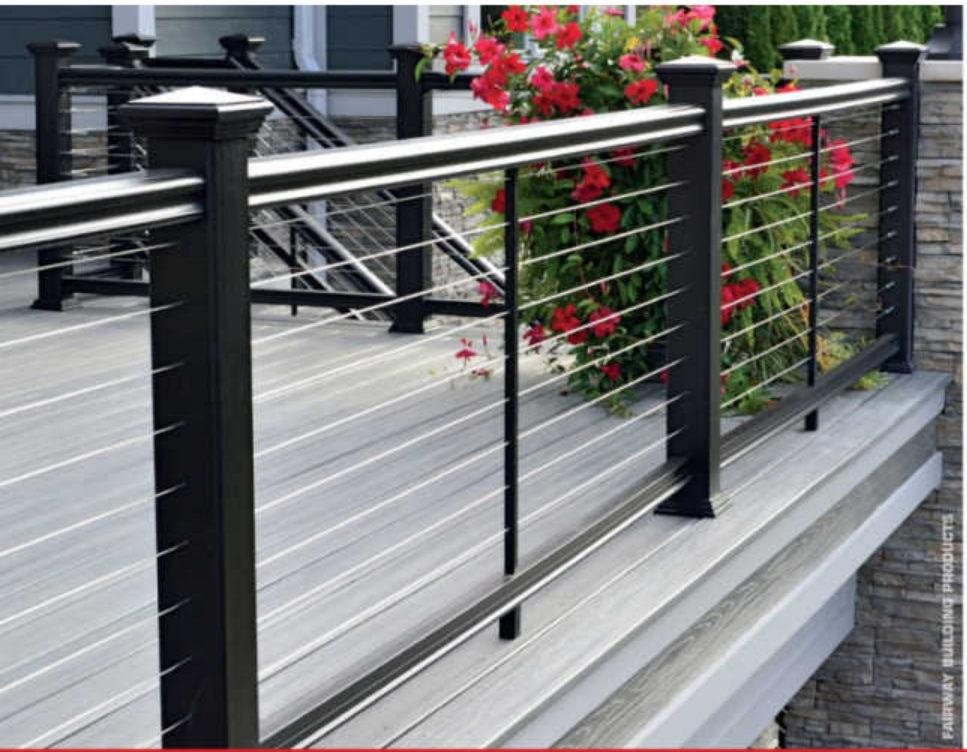
The Red Dot Deck Grommet Pro makes it simple to add waterproof electrical outlets anywhere you'd like on a new or an existing deck. When not in use, it folds flush with the deck boards. Check it out at tnb.com, look for it at the home center or just search for "deck grommet pro" online. Expect to pay about $60.

Practically indestructible decking

Like other fiber cement products like siding and trim, PlyCem's CemDeck decking boards are fireproof and impervious to rot and insects. Composed largely of Portland cement and cellulose from recycled cardboard, they're also highly resistant to weather, impact and mold.

CemDeck deck boards are 12 ft. long and currently available in cedar-grained brown. There are two types of planks for two types of fastening options: a slotted edge version to receive hidden fasteners and a rounded edge for exposed deck screws. Expect to pay about $2.70 per linear foot. Matching fascia is also available for stair risers and finishing off deck rim joists.

CemDeck is a brand new material, so it won't be widely available for a while. But if you're interested in using fiber cement decking down the road, maybe even later this year, check it out at architecturalproducts.com/plycem.



Cable rails

Installing upscale cable rails on a new deck used to be a DIY challenge. It wasn't easy to collect all the cable, sheaths, thimbles, turnbuckles and whatnot and then cobble together your own system onto wooden 4x4 posts. Now you can buy high-quality components in kit form that not only look fantastic new but also stay looking that way for years—all the parts are made from stainless steel and aluminum.

Fairway Building Products is one company that has put it all together for you. It offers a very sophisticated cable rail attachment and tensioning system along with a finished aluminum post and rail system that's designed to anchor the cable. Watch a video, download the price book and find a dealer at fairwaybp.com.

Travis Larson, Senior Editor

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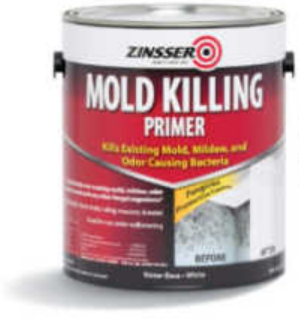
This primer is killer.



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Serious heavy-duty driver and drill

I love Milwaukee's new impact driver and hammer drill: brushless motors for longer run-times, Milwaukee's best batteries and all the bells and whistles (LED lights, power meters, belt hooks, etc.). I've used these tools hard for a few months now and they haven't let me down. I was particularly impressed by the impact driver's speed selector, which can give you better control when it's set for slow speed.

The two tools are available as a set, with two batteries and a charger for $299 at The Home Depot (model No. 2797-22). Plus, you'll find lots of other pro tools that use the same excellent battery platform.

Ken Collier, Editor at Large

165-ft. laser measure

If you do much estimating or working alone, a laser measure can be a real time-saver. It's easy to operate: Hold the laser to one surface, turn it on and measure to a distance of up to 165 ft. You can also use it to calculate area, volume and angles, and record all your results wirelessly on your phone. There's also a handy digital level.

For many contractors and real estate agents, a laser measure is an essential tool. But DIYers may also find one handy: It's like a super-long, one-handed tape measure that you can slip into your pocket. You can buy the Bosch 165-ft. Laser Measure for about $149 at The Home Depot and other retailers.

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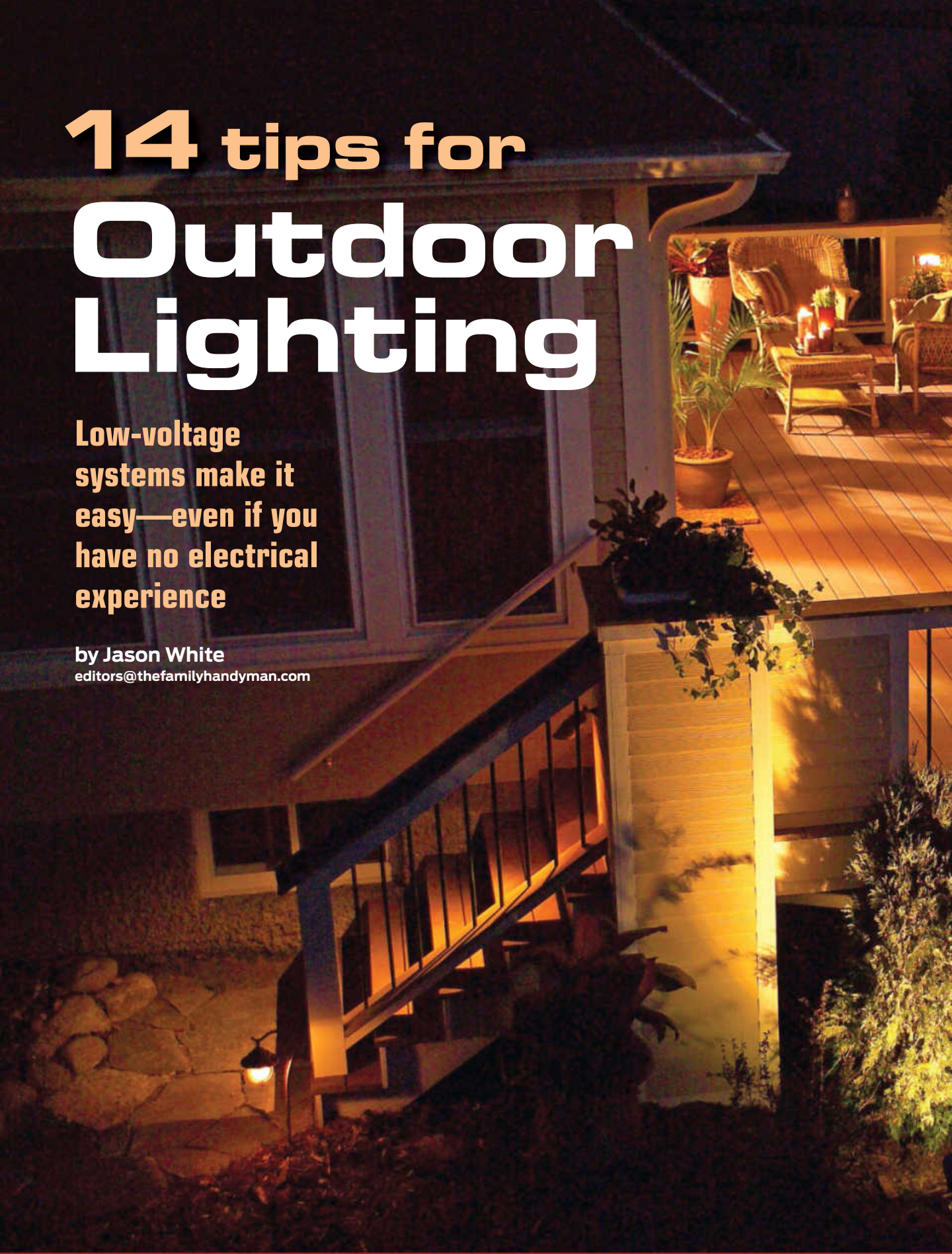
14 tips for Outdoor Lighting

Low-voltage systems make it easy—even if you have no electrical experience

by Jason White
editors@thefamilyhandyman.com



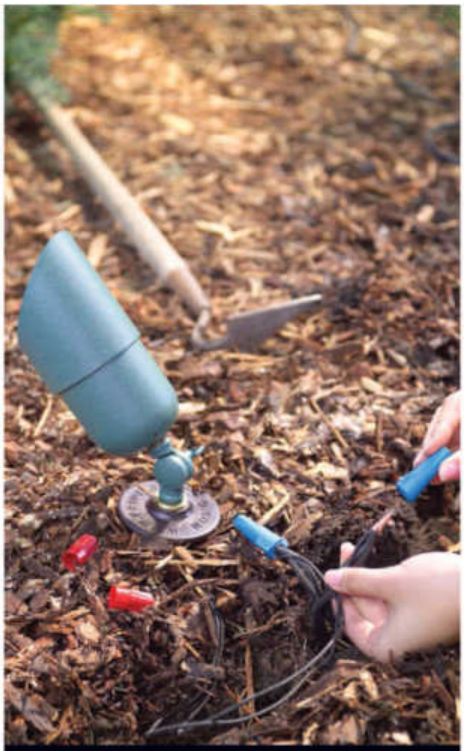
Imagine a relaxing afternoon out on your deck or patio. The weather's perfect, the cooler's stocked and you've got steaks sizzling on the grill. Everybody's happy—until the sun goes down and an old 100-watt flood light turns itself on, blasting its blinding, bright light into the eyes of all your guests.

It doesn't have to be that way, you know. There are lots of great outdoor lighting options available. And because most are low voltage, any DIYer can install them. A little planning and the right advice are all you need, so here are some tips for lighting your path back to backyard bliss.

ART DIRECTION **MARCIA ROEPKE** • PHOTOGRAPHY **HSP**

NO ELECTRICAL EXPERIENCE NECESSARY

Since most outdoor lighting is low voltage, it's safe and easy enough for any DIYer to install. In fact, the only special tool you'll need is a wire stripper.



Install underground wiring after planting

To prevent accidental cutting of wiring for ground-level fixtures, install wiring *after* your landscape has been planted. That way you won't accidentally chop through it with a shovel. Also, don't install wiring in digging areas like garden beds, and be sure to bury low-voltage wire at least 6 in. below the surface.

HOW IT ALL FITS TOGETHER

A LOW-VOLTAGE SYSTEM HAS THREE PARTS:

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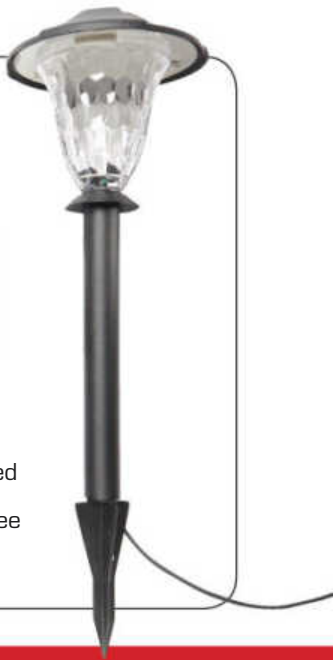
The **LOW-VOLTAGE CABLE** carries current between the transformer and the light fixtures.

The **LIGHT FIXTURES** get connected to the cable with wire connectors made specifically for outdoor use (see "Skip the Quick Connectors," p.19).



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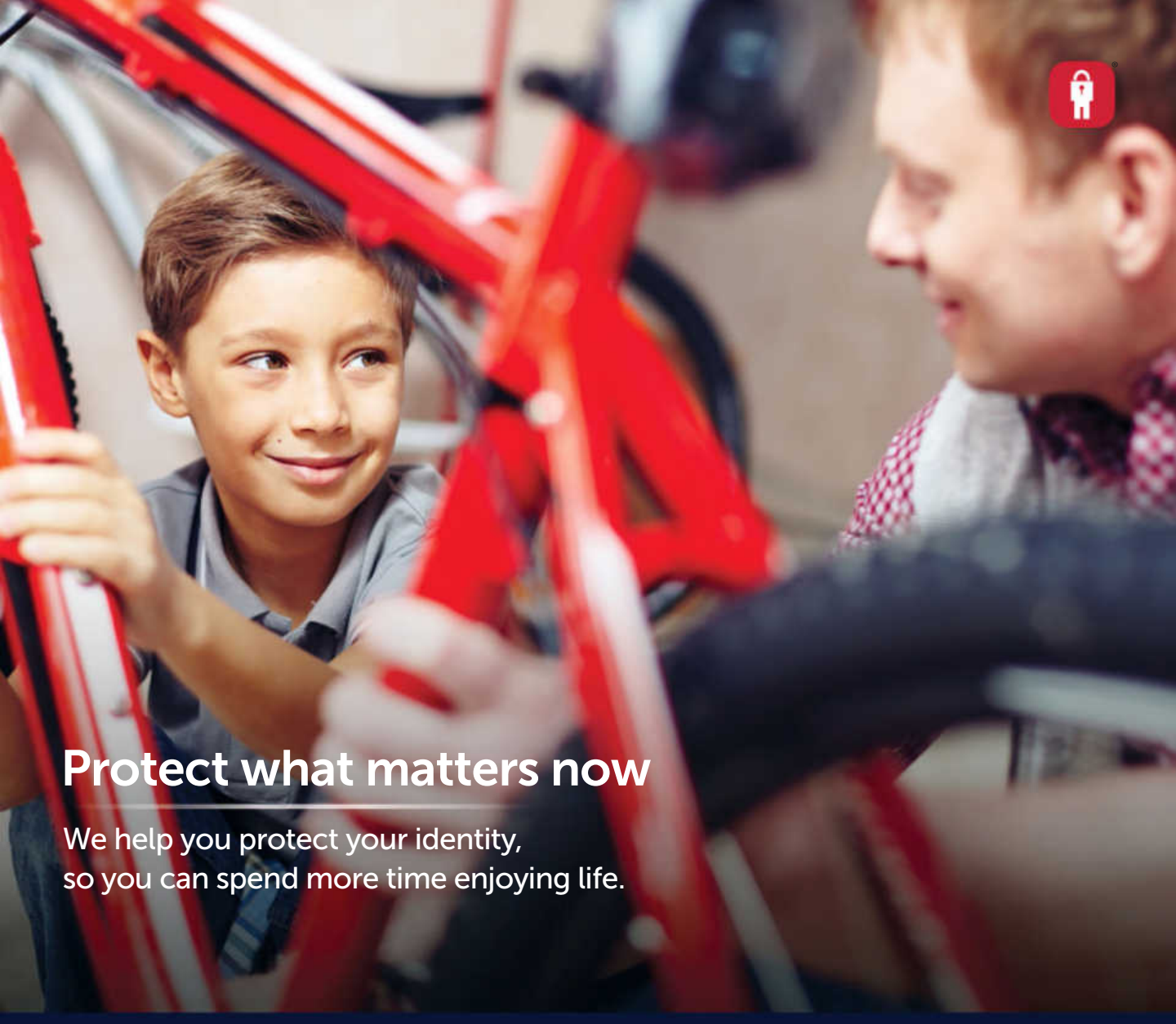

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Keep your fixtures; upgrade your bulbs

For decades, halogen lights reigned supreme in low-voltage outdoor lighting systems, but LEDs have all but replaced them because they cost less to operate and last much longer. But you don't have to tear out all your old halogen fixtures to enjoy the benefits of LEDs—retrofit bulbs are available. Just be sure to replace each halogen bulb with equivalent wattage and the same base type.

Expect to pay about four times more for an LED bulb, but they use less energy and you'll get up to 20 years of life from one compared with only two or three years from a halogen. We paid $18 for the LED bulb in this photo vs. $4 for the halogen bulb.

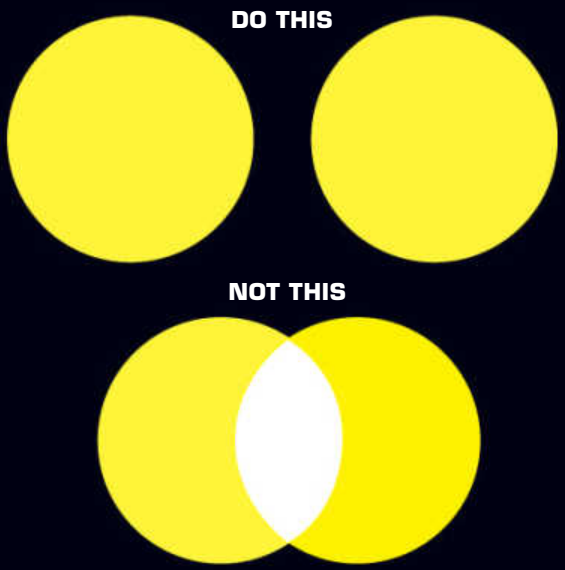
MR16 LED BULB

MR16 HALOGEN BULB

DESIGN TIP

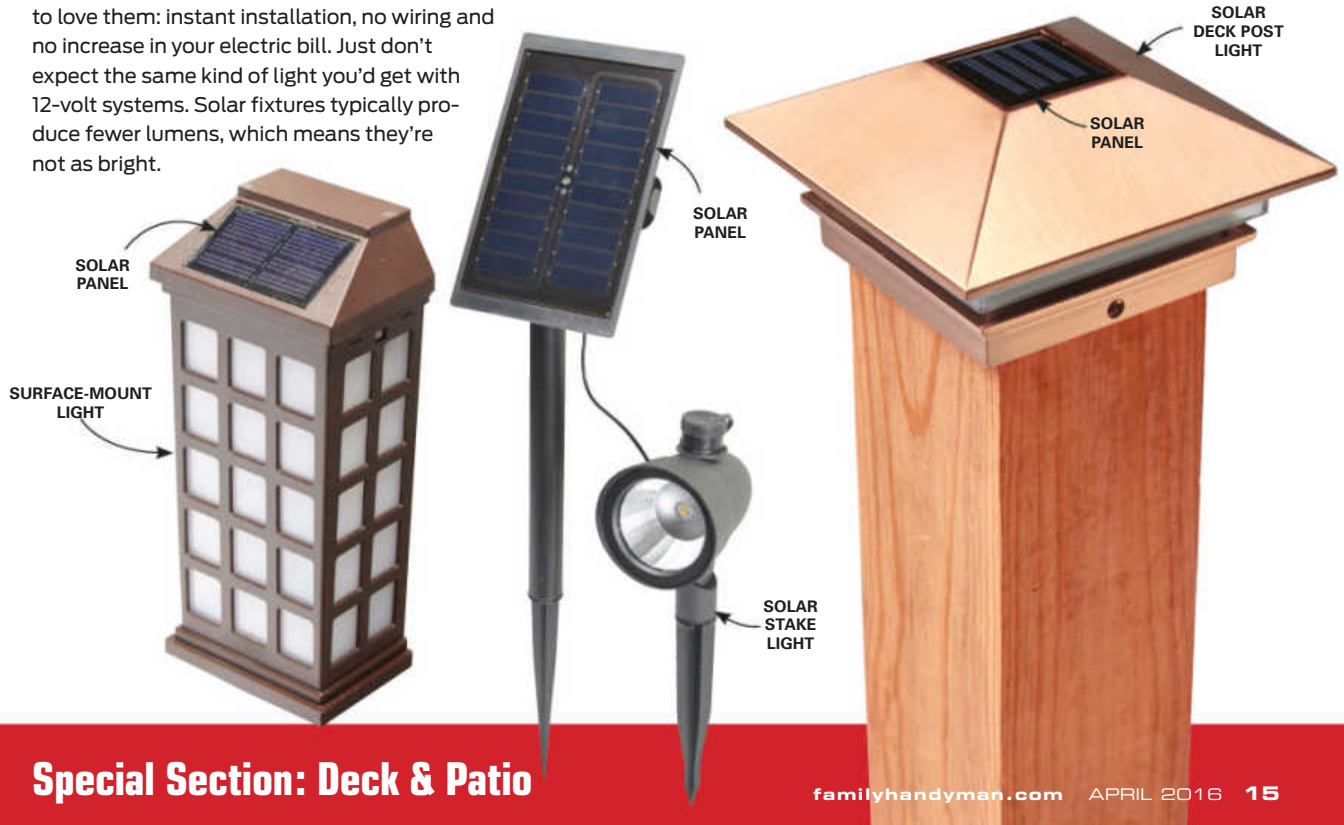
DON'T OVERLAP POOLS OF LIGHT

The purpose of most deck lighting is ambience, and professional outdoor lighting designers say it's best not to create overlapping "pools" of light on decks and patios. So avoid mounting fixtures too close together. For decks, choose fixtures that cast a 4- to 5-ft. pool of light. Keep them 30 in. up off the deck's floor and space them up to 10 ft. apart. Overlapping lights on deck stairs and walkways can be a good thing, however, by providing enough light to help people avoid tripping.



GO SOLAR?

Options for solar landscape and deck lights have exploded at home centers. And there are some reasons to love them: instant installation, no wiring and no increase in your electric bill. Just don't expect the same kind of light you'd get with 12-volt systems. Solar fixtures typically produce fewer lumens, which means they're not as bright.



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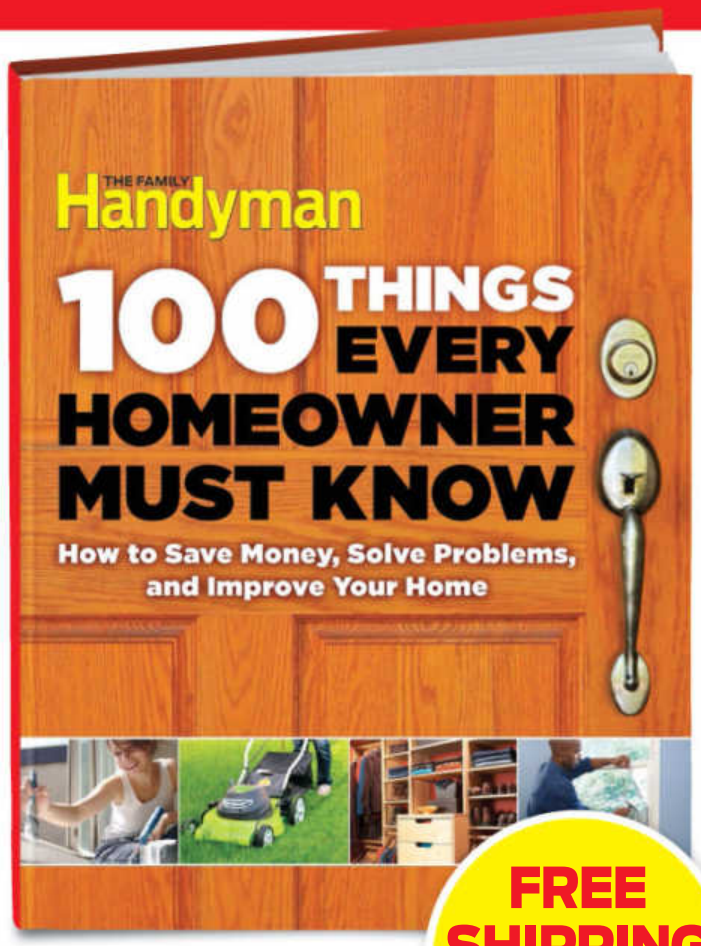

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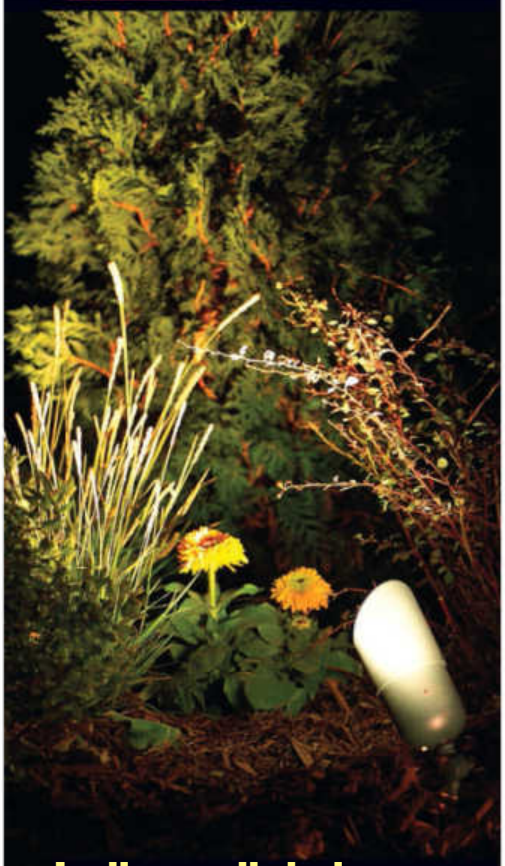


Indirect lighting works great for patios

Instead of focusing lights directly onto a patio, try lighting objects around it, like boulders and trees. This eliminates glare and creates attractive shadow effects.

Kits for convenience

You can buy complete ground-level landscape lighting kits at a home center for $40 to $200. Kits are convenient and adequate if you only need a few fixtures. But the transformer—sometimes called a power pack—will be too small if you decide to add more fixtures down the road, and style options for fixtures will be much more limited with a kit. For a deck lighting system, plan to buy individual components.

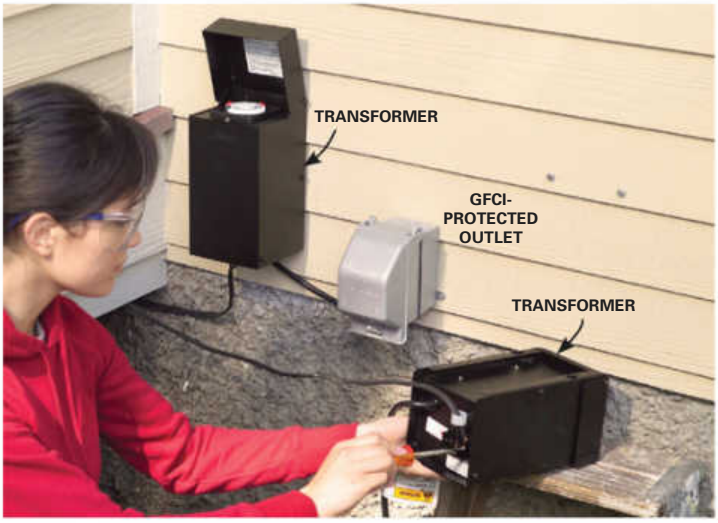
Skip the quick connectors

Some landscape lighting kits have preinstalled quick connectors, but they aren't what the pros use. Cheap connectors buried underground will work for a while, but they can corrode over time and fail. Cut off the factory-installed connectors and make splice connections using gel-filled wire connectors made specifically for outdoor use.

DESIGN TIP

Experiment with clamp lights

Before you buy anything, make a sketch of your deck or patio on graph paper and plan the location for each of your new light fixtures. To get an idea of the effect a fixture will give, pick up a clamp light for about $8—the kind with a metal reflector shade—and a few different types of lightbulbs with different brightnesses. Then, when it starts to get dark, try out the clamp light using different bulbs in a few different spots so you can observe their effect. Mark the most desirable locations on your drawing, and pay particular attention to lighting areas like stairs and transitions to different levels for safety.



You can keep your old transformer

Any older low-voltage transformer can be used to power both halogen and LED lights—even if they're mixed on the same circuit—as long as you have enough wattage to spare in your old transformer. If your transformer isn't big enough to handle the additional load, add a second transformer or upsize your existing one.

BUY THE RIGHT TRANSFORMER

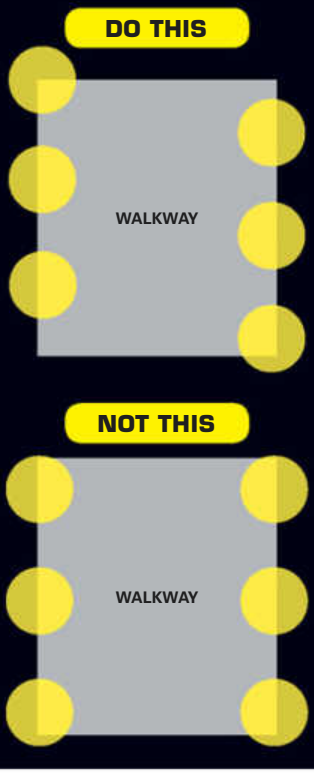
A "low-voltage" lighting system starts with a transformer plugged into a GFCI-protected receptacle. The transformer's job is to convert 120-volt household current to 12 volts before sending it through special outdoor cable to light your fixtures. Just a few years ago, you would have needed a 600- to 1,200-watt transformer to light a yard full of halogen lamps. But because LEDs use fewer watts than their halogen predecessors, smaller transformers—45 to 300 watts—are usually all that's needed.

So how big should you go? Just do the math! Simply add up the wattage for all the light fixtures you're planning to install, and use that number to pick the right transformer. Buy one slightly bigger than you need in case you decide to add fixtures in the future. Expect to pay $40 to $100 for a transformer at home centers, depending on the size.

DESIGN TIP

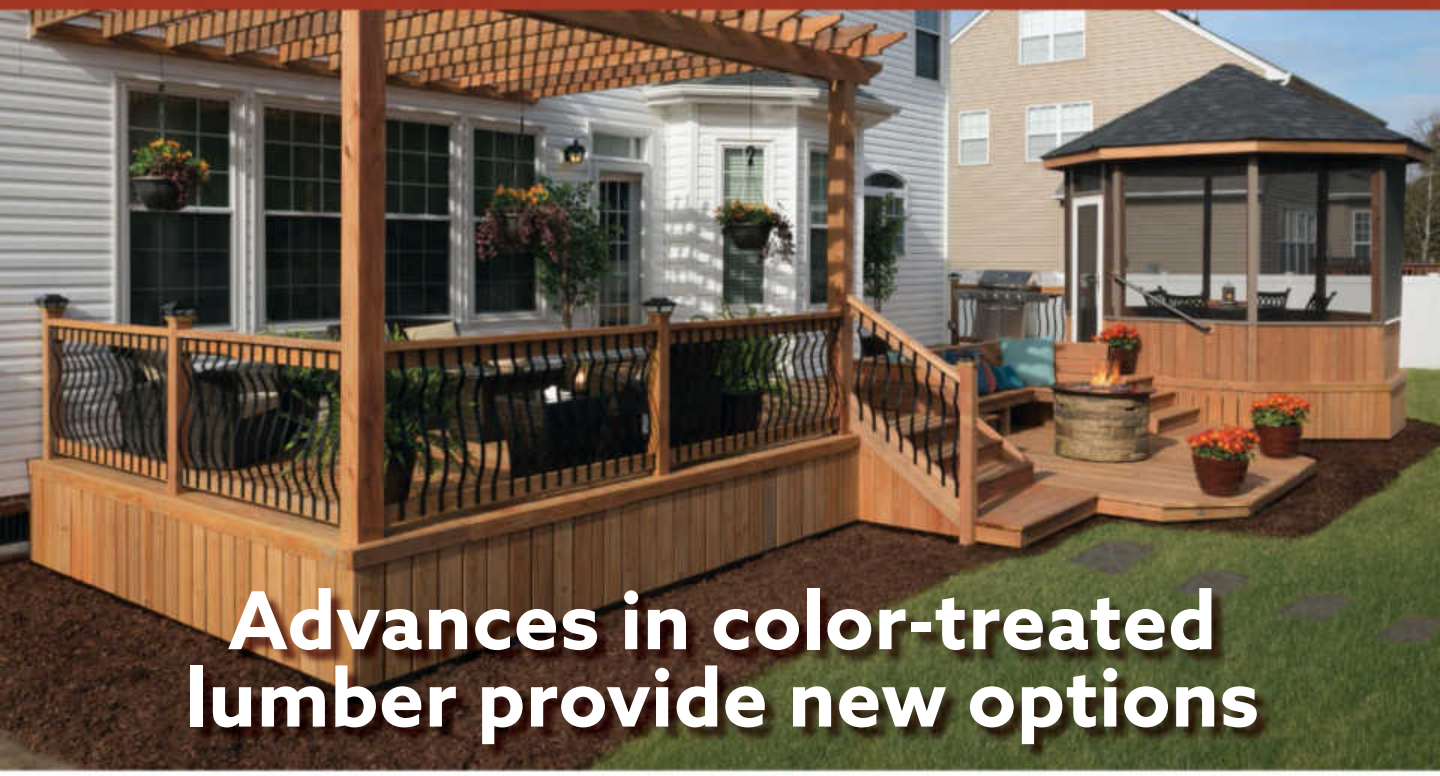
AVOID THE RUNWAY EFFECT

To prevent making your walkway look like an airport runway, stagger lights so they're not perfectly parallel.



Run wire under walkways

If you need to run wiring under an existing walkway, try this trick: Dig a small trench on both sides. Next, flatten the end of a piece of rigid metal conduit and use a sledgehammer to drive the conduit, flattened end first, horizontally under the walkway. Then cut off the ends of the conduit with a hacksaw, file off the sharp edges and feed your wire through the conduit. A 10-ft. stick of rigid steel conduit (the thick, heavy-duty stuff) costs about $13 at home centers.



Advances in color-treated lumber provide new options

Homeowners want new building products that provide more value with less maintenance and are environmentally friendly. With the advent of an environmentally preferred treating product—micronized copper azole (MCA)—many consider treated lumber the most cost-effective, eco-friendly and easy-to-install decking option. (Plus, it doesn't get that greenish hue that occurs with many older treating products.) And now there's something even better: a newly formulated, color-treated lumber that is on the verge of becoming mainstream, providing a unique, low-cost option for pros and DIYers.

ProWood Dura Color® pressure-treated lumber helps fill the gaps between everyday treated wood decking, cedar and redwood decking, and high-end synthetic decking. It's not a topical stain that fades away; it's a colorant that's driven deep into the wood fibers, creating beauty that's guaranteed to stand up to the elements for years. The Dura Color treating process provides a rich cedar-tone or redwood-tone appearance that doesn't fade to gray, unlike cedar and redwood. The color is part of a treating process that includes an EPA-registered, waterborne wood preservative system to protect against termite attack and fungal decay (rot). In addition, new water-repellant stabilizer additives are helping MCA-treated wood decking like ProWood resist the effects of weathering.

Latest advancements in color-treating technology let the woods natural characteristics remain visible

So today you can get wood that protects against the elements and offers long-lasting, beautiful color.

Color-treated wood isn't new. Koppers Performance Chemicals (formerly Osmose Wood Preservation) is a leader in wood preservative technologies that has been providing color-treating solutions for years. In fact, Universal Forest Product companies have been producing colored wood fencing for nearly a decade. But with the new color-treating technology, lumber decking has made significant strides, offering a better look for a treated lumber deck. Although composite and PVC decks have gained market share in recent years, pressure-treated wood decking still carries the lion's share of the market. And it's no wonder: It's inexpensive, easy to work with and can be found at any lumberyard.

In addition to decking, ProWood Dura Color is available in virtually any size dimensional lumber as well as finished products (like fencing and pergolas), giving DIYers more building options.

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For more information, visit ProWoodLumber.com

Treated Lumber Never Looked So Good.

8116 1/15

Classic GARDEN BENCH

Dowel construction makes it solid—and surprisingly simple

You've probably seen benches similar to this one in parks, porches or movies. That's because this classic style fits into any setting, rustic or elegant. If you've ever considered building one of your own, you might have been discouraged by the complexity of the project—all those parts, all that joinery... But scan the next few pages and you'll see how I simplified the building process. Dowels make the joinery easy but strong, and router templates guarantee that the curved parts will be perfectly uniform.

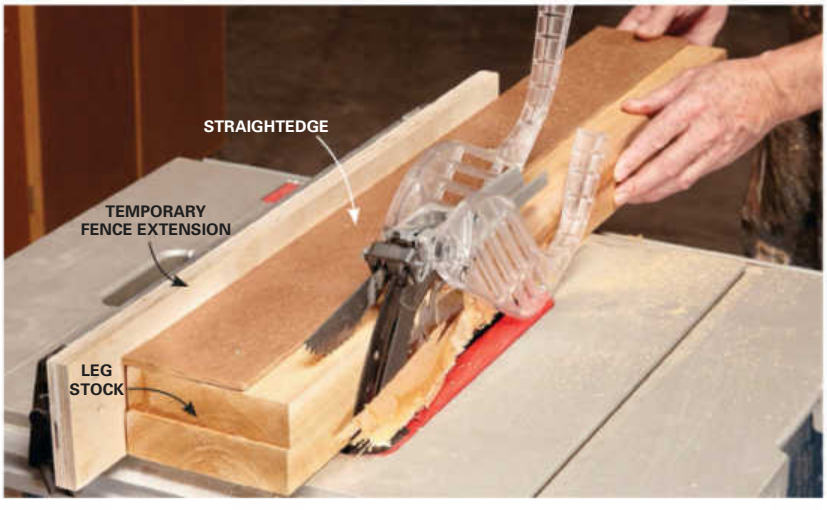
by David Munkittrick
editors@thefamilyhandyman.com

WHAT IT TAKES

TIME: 2 weekends
COST: $150
SKILL LEVEL: Intermediate
TOOLS: Table saw, router and bits, jigsaw, clamps, dowel jig

ART DIRECTION **MARCIA ROEPKE** • PHOTOGRAPHY **TOM FENENGA** • TECHNICAL ART **FRANK ROHRBACH III**

1 GLUE UP THE LEG STOCK
Make the back leg stock from two 2x6s or three 1x6s. Use 2x4 cauls to spread clamping pressure evenly. Don't skimp on clamps, and be sure to use waterproof glue such as Titebond III.



2 CUT A STRAIGHT, EVEN EDGE
Nail a straightedge made from an MDF or wood scrap onto the leg stock with the straightedge overhanging slightly. Run the stock across a table saw with the straightedge against the fence to cut a perfect edge.

3 SHAPE THE BACK LEGS
Rough-cut each back leg with a jigsaw. Then make a template from 1/4-in. MDF and tack it to the leg. Run a top-bearing pattern bit around the template. The bit will cut only about halfway through the leg thickness.

MEET THE EXPERT

Dave Munkittrick is a professional woodworker and former editor at *American Woodworker* magazine.

Tools and materials

You'll need a dowel jig for this project (see p. 30). A planer, miter saw and band saw will come in handy but aren't absolutely necessary. You'll need two specialty router bits: a "pattern" bit and a "flush-trim" bit (1/2 in. diameter or larger, with a 1-1/4-in. cutting length). You can find both at some home centers or online, starting at less than $20 each. You'll also need 1/4-in. and 3/4-in. roundover bits and a plug cutter to make plugs to cover the screw holes.

I used cedar lumber for my bench. Other good choices for outdoor furniture include redwood, teak and white oak. If you choose cedar, select stock that's free of large or loose knots and knotholes. If you prefer a knot-free look, buy wide stock and use the best of it. For example, a 2x10 board might yield enough knot-free stock for the legs, back and seat rails. Avoid any boards with a lot of white "sapwood" because it doesn't weather as well as the darker heartwood.

Make the legs

To make the leg stock, I planed 2x4s and 2x6s down to a thickness of 1-1/8 in., then glued them together for a leg thickness of 2-1/4 in. (**Photo 1**). If you don't have a planer, you can use three layers of 1x4s and 1x6s to achieve the same thickness (as shown on p. 26).

After the glue sets, you'll need a straightedge to guide the leg stock on your table saw. Quarter-inch MDF works well. Use brad nails to attach the straightedge to the leg stock so it slightly overhangs the stock along one edge. Run the stock through your table saw using the overhanging straightedge as a guide (**Photo 2**). The result is a perfect edge. Use the freshly cut edge against the fence to rip your leg stock to final width.

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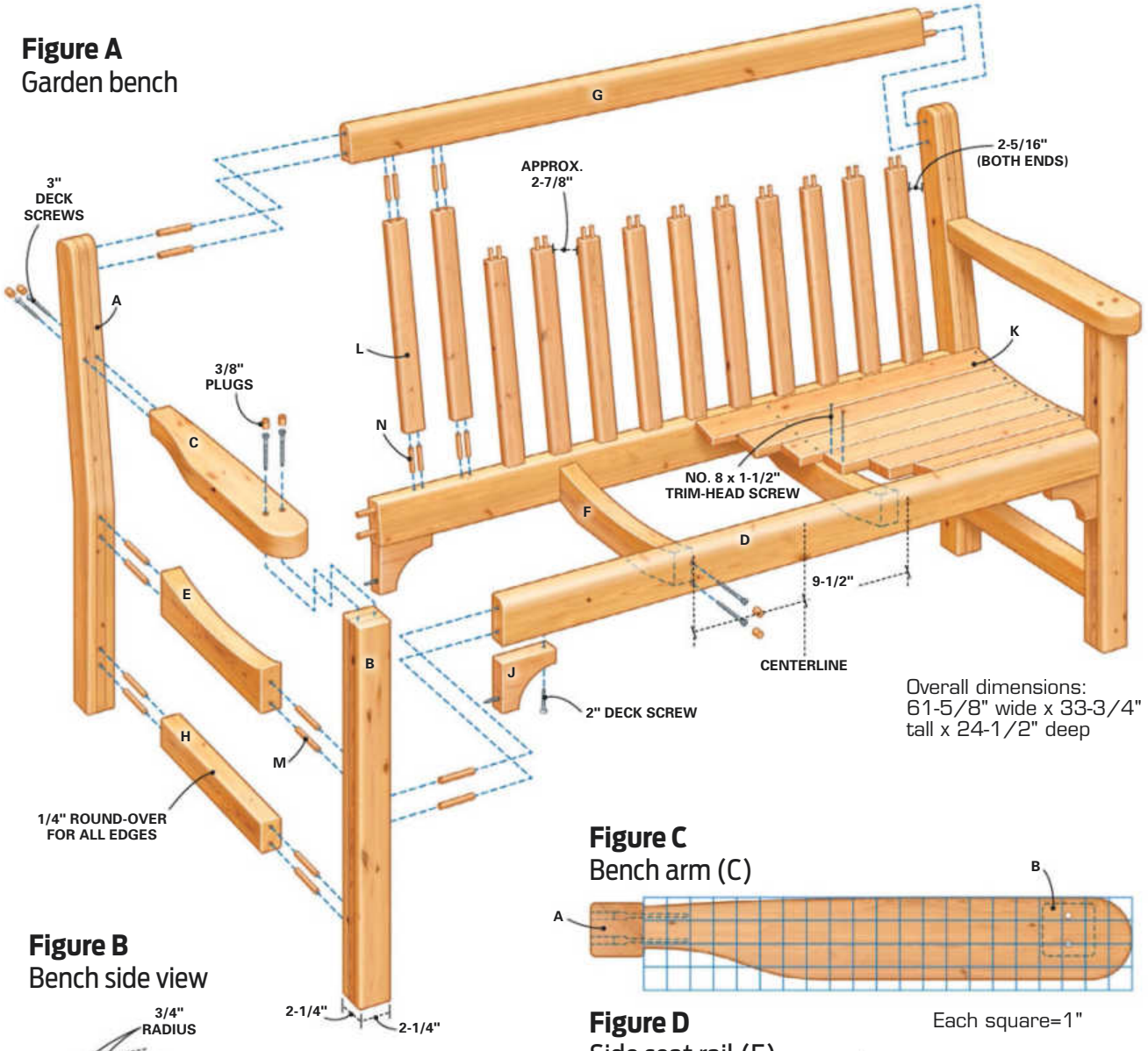
Figure A
Garden bench



Overall dimensions:
61-5/8" wide x 33-3/4" tall x 24-1/2" deep

Figure B
Bench side view

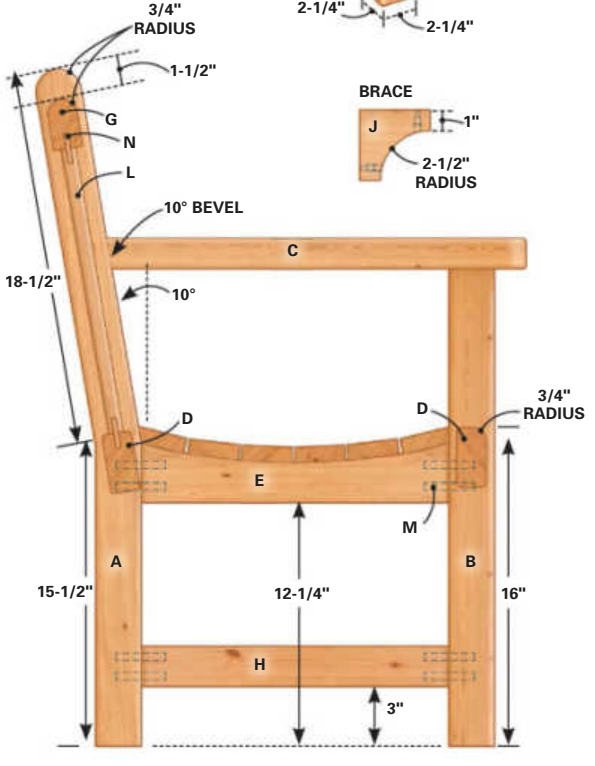


Figure C
Bench arm (C)

Each square=1"

Figure D
Side seat rail (E)

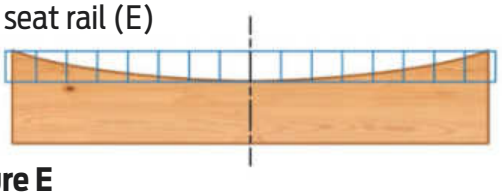
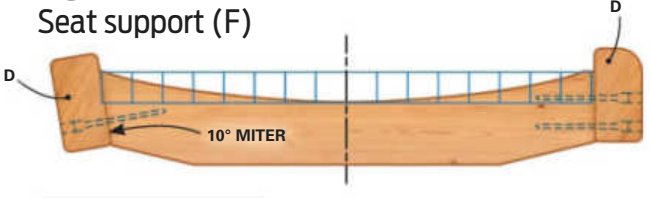


Figure E
Seat support (F)



Materials List

ITEM	QTY.
2x4 x 8' cedar	4
1x6 x 8' cedar	6*
No. 8 x 1-1/2" trim-head screws	
2" deck screws	
No. 8 x 3" deck screws	16
No. 6 or No. 7 stainless steel trim-head screws	48
1/4" fluted dowels	48
3/8" fluted dowels	28

* You can substitute two 8' 2x6s for three of the 1x6s for the leg stock if you have access to a planer.

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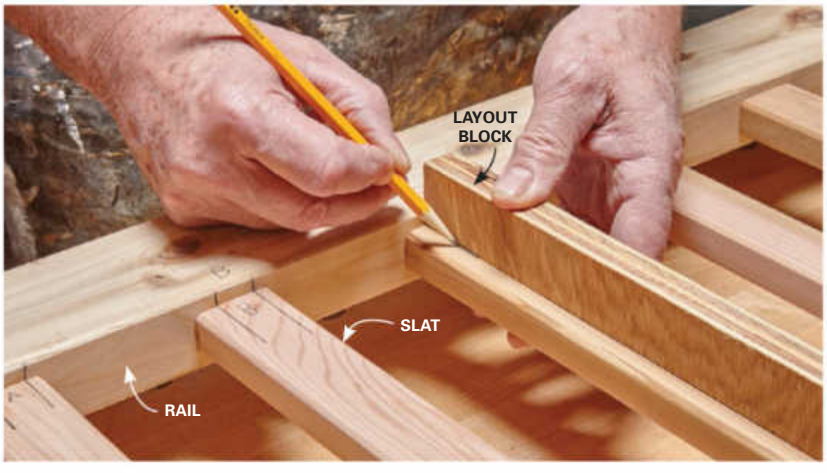
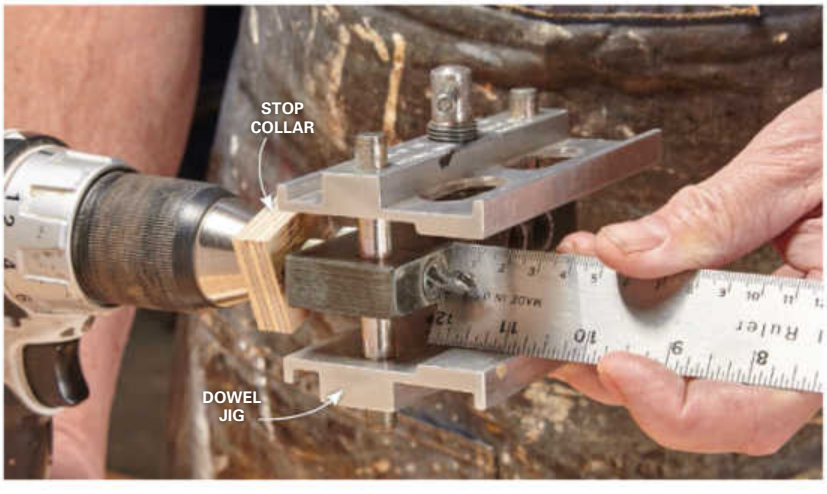
4 COMPLETE THE BACK LEGS
Flip the leg over and make a second pass using a flush-trim bit. This bit has a bearing on the bottom and will follow the shape already cut by the pattern bit.



5 MARK THE DOWEL LOCATIONS
Center a block of 3/4-in. plywood on each back slat. No need to measure—just center the block by eye. Mark each slat and the rail along both sides of the block. Label each joint with a letter as a guide for assembly later.



6 SET THE DRILL DEPTH
Bore through a block of 1/2-in. plywood to make a stop collar for your drill bit. Insert the bit through the jig and adjust the bit to establish the proper depth for the dowels. Always add a little extra depth to allow for excess glue in the bottom of the hole.

Cut the front legs (B) to length. To shape the back legs (A), first make a template from 1/4-in. MDF. While you're at it, go ahead and make templates for the arms (C; **Figure C**), side seat rails (E; **Figure D**), seat supports (F; **Figure E**) and seat braces (J). Templates save time—it's so much easier to shape a thin scrap of MDF than a thick cedar blank. A template also produces perfectly matched parts with ease.

Use the back leg template to draw an outline of the leg onto the blank. Rough-cut the blank with a band saw or jigsaw. Attach the template to the rough-cut blank with brad nails and rout the profile using a pattern bit (**Photo 3**). Flip the blank over and finish the leg profile using a flush-trim bit (**Photo 4**). Use the other templates in the same way to create the arms, seat supports, seat rails and braces. **Note**: Do not cut the seat braces to final length yet. It's best to wait until the bench is assembled for final fitting. Also, lay out and rout the braces on a single board. Then cut them to length.

Cut and machine the seat rails (D), top rail (G), leg braces (H), seat slat (K) and back slats (L). Go ahead and rout the 1/4-in. radius on all the long edges plus the 3/4-in. radius on the top front edge of the front seat rail (D) and the front and back top edge of the top rail (G; **Figure A**). I also rounded over the ends and corners on the seat slats. It's a lot easier to shape and sand the parts now, before assembly.

Dowel the back

Dry-clamp the slats between the top rail (G) and the seat rail (D). Clamp the first and last slats in place then fit the others into place (see **Figure A** for correct spacing). You may need to add a clamp in the middle to hold all the slats in place. Mark for dowel locations with a layout block (**Photo 5**). The layout block really speeds up marking for the dowel holes because there's no need to measure. Be sure to use a letter mark for each slat, top and bottom. Write the corresponding letter on the top or bottom rail. It's essential to glue up the slats in the same location as they were marked for drilling. With the slats and rails marked, it's time to break out the dowel jig.

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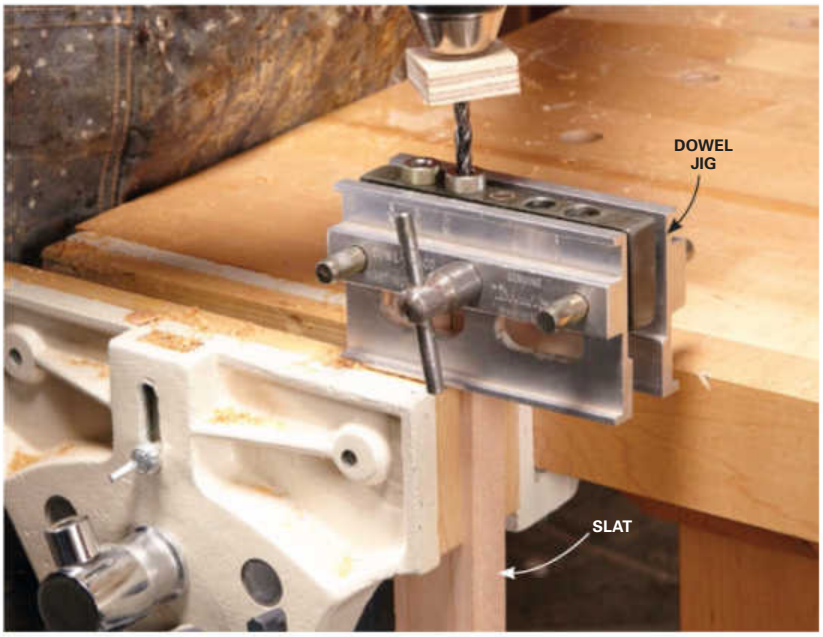
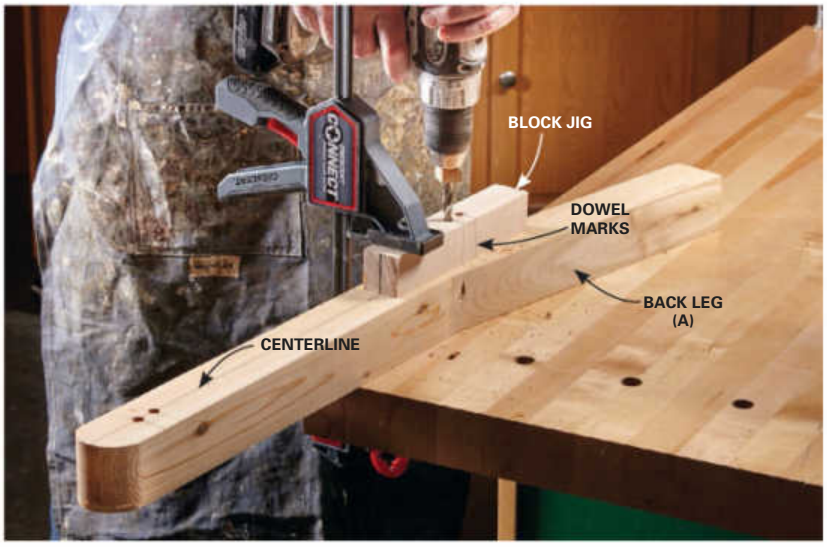


7 DRILL DOWEL HOLES
Align the marks on the dowel jig with your marks on the bench part and lock the jig onto the part. It's best to drill the holes in two steps. Drill about halfway, remove the bit to clear out the wood chips and then finish the hole with a second plunge.



8 DRILL THE RAIL HOLES
The dowel jig can't position the holes for the lower back seat rail (D), so make a simple block jig. Align the dowel marks on the jig with the dowel marks on the leg and align the centerlines on both ends of the jig with a centerline marked on the leg.

CHOOSING A DOWEL JIG

Dowel jigs are inexpensive (starting at about $20) and easy to use. They make very strong joints. But some jigs aren't a good choice for this project. Look for two features:

- **It needs to fit over the 2-1/4-in.-thick legs.**
- **Interchangeable bushings or sleeves that allow you to drill pairs of 1/4-in. or 3/8-in. dowel holes.**

I used the Deluxe Doweling Jig from woodcraft.com ($65; item No. 811565) for this project.

Screw two 1/4-in. sleeves into the threaded holes of the jig. Chuck a 1/4-in. bit in your drill. Brad-point bits work the best for doweling because they drill a flatter bottom. Set the bit for the proper depth (**Photo 6**). For shorter dowels, you'll likely need a stop collar to achieve the correct depth.

Mount the jig on the end of a slat, aligning the marks on the jig with your pencil marks. On short, narrow stock like this, I use my bench vise to hold the stock and support the jig (**Photo 7**). Drill double 1/4-in. holes in the back slats. On the rails, set the jig on the first set of holes, drill, then loosen the jig and slide it down to the next set of marks.

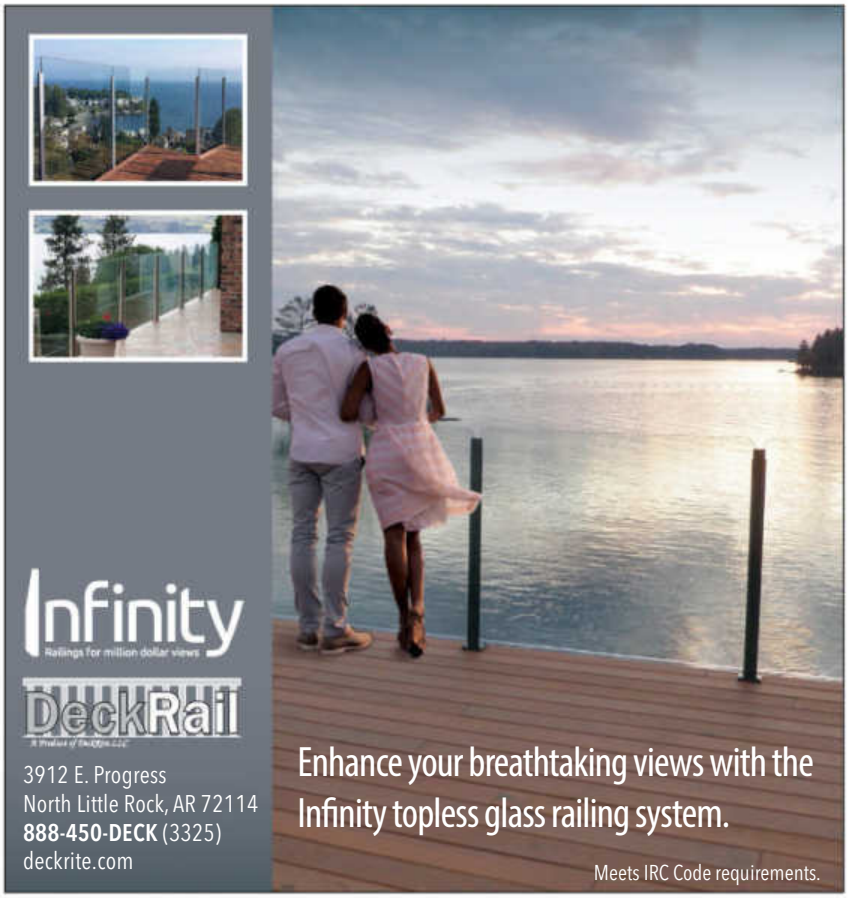
Assemble the back

With all the 1/4-in. holes drilled, go ahead and assemble the back with dowels but no glue. You want to double-check to be sure everything lines up correctly first. Trust me; it's well worth the extra time and effort to do a dry fit before final assembly. If everything fits, reassemble with glue. To spread the glue in the hole, I use a 1/8-in.-diameter dowel as an applicator. Just dip the narrow dowel stock into your glue and then swirl it around the dowel hole. I also put a light coat of glue on each dowel with a small flux brush.

Build the sides

While the glue sets on the back assembly, mark and drill the double 3/8-in. holes for the side/leg assemblies. Use the assembled back to mark the dowel location on the back legs. Dry-clamp the back into position between the two legs, then mark for the dowel holes using the layout block. The back seat rail holes are located on the straight part of the leg but aligned with the angle of the back (**Figure B**). This won't allow you to use the store-bought jig.

Instead, make a jig from a block of hardwood approximately 1-1/4 in. x 1-1/4 in. x 6 in. Mark two lines across the middle 3/4 in. apart. Square the lines around the block. Use your doweling jig to drill a pair of 3/8-in. holes centered on the marks. Also mark two vertical lines centered on each end of the block. Finally, draw a centerline down the top portion of the leg that supports the back.



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9 PUT IT ALL TOGETHER
After building the back and leg assemblies, dowel and clamp them together. If your pipe clamps are too short, join pipes with threaded couplers.

Drill the double holes at the top of the leg using the dowel jig. To drill the bottom holes, set the block so the dowel position marks on the jig align with the dowel position marks on the leg. Also be sure the centerlines on the jig and the leg align. Clamp the jig in place and drill (**Photo 8**).

Final bench assembly

Dry-clamp the side assemblies with dowels and check for proper fit. Glue up the two side assemblies. Then glue and dowel the back assembly and the front seat rail (D) to the side assemblies (**Photo 9**).

Now all that's left is to attach the arms and seat supports with screws (**Photo 10**). You'll want to hide the screws for the best appearance, so make sure to drill a 3/8-in. countersink hole first, then the pilot holes. Attach with stainless steel screws or other corrosion-resistant screws such as deck screws. Use a 3/8-in. plug cutter to cut plugs. Glue the plugs into place with waterproof glue, making sure the grain in the plug aligns with the grain in the piece.

Finally, attach the seat slats. For the best look and fit, cut a 10-degree bevel along the front edge of the first slat and the back edge of the last slat. Attach the slats with stainless steel trim-head screws. The heads are so small on these screws that there's no need for a plug.

Apply finish

After you do a little touch-up finish sanding, you'll be ready to apply a finish. A quality outdoor deck stain is a good choice. I used a clear stain on mine, which greatly enhances the natural color of cedar. A darker stain obscures the wood a bit more, but it does offer better UV protection. For best results and the longest life for your bench, you should recoat it every year. Don't forget to add an extra dose of finish on the end grain of the wood where it contacts the ground.

Now you can sit back, relax and enjoy the view.

10 ADD THE FINAL PARTS
Attach the arms, seat braces and rail supports with screws. Use stainless steel or coated screws to guard against rust stains. For the visible screw holes on the arms and rails, countersink first and insert plugs to cover the screws.

Cutting List

KEY	QTY.	DIMENSIONS	NAME
A	2	2-1/4" x 2-1/4" x 33-3/4"	Back leg
B	2	2-1/4" x 2-1/4" x 24"	Front leg
C	2	1-1/2" x 3-1/2" x 21"	Arms
D	2	1-1/2" x 3" x 55-1/2"	Seat rail
E	2	1-1/2" x 3" x 15-1/2"	Side seat rail
F	2	1-1/2" x 3" x 16-1/4"	Seat support
G	1	1-1/2" x 2-1/2" x 55-1/2"	Top rail
H	2	1-1/2" x 2" x 15-1/2"	Leg brace
J	4	1" x 3-1/2" x 3-1/2"	Brace
K	6	3/4" x 2-1/2" x 60"	Seat slat
L	12	3/4" x 1-1/2" x 14-1/2"	Back slat
M	28	3/8" x 2-1/2"	Fluted dowel
N	48	1/4" x 1-1/2"	Fluted dowel

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Handy HINTS®

FROM OUR READERS handyhints@thefamilyhandyman.com

EDITOR JASON WHITE • ART DIRECTION MARCIA ROEPKE • PHOTOGRAPHY PAUL NELSON and TOM FENENGA UNLESS NOTED

SPRING SLEDDING

A plastic snow sled is useful in the off-season, too. I use mine to haul yard debris, bags of concrete and plants. The sled slides over grass, sand and gravel with ease. We've even used it to haul camping gear from our car to our campsite ... works great!

Dean Toth

Vinegar gets the gunk

I like to keep my lawn equipment really clean. For items like my string trimmer, I simply scrub off all the muck with an old dish brush and white vinegar. It takes about 15 minutes for my string trimmer to go from drab to fab!

Richard Johnson

Garden hose roundup

I store my garden hoses coiled up inside a round garbage can all winter. My lawn sprinklers fit well in the center. Come spring, I'm ready to go.

Norman Schock

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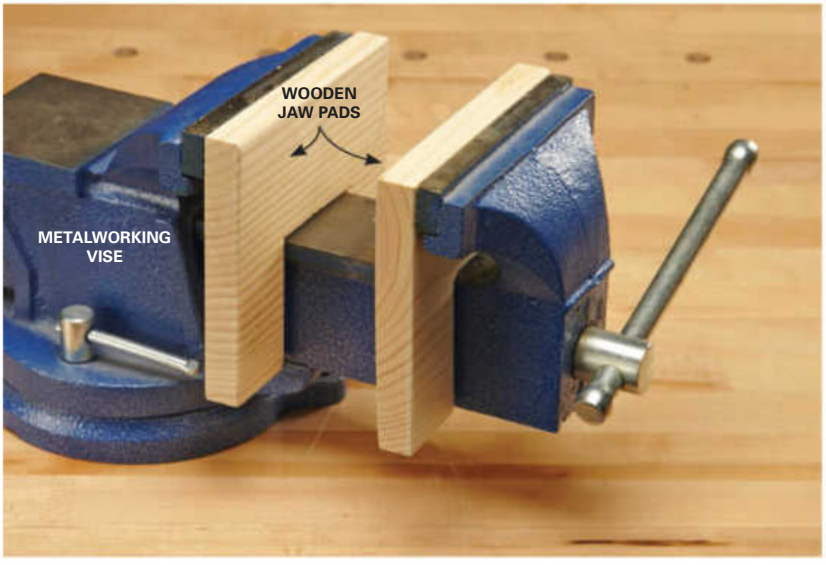


DOUBLE-DUTY VISE

I have a metalworking vise in my shop, but occasionally I need a woodworking vise. Rather than buy another vise, I put wooden pads on the shaft of my metalworking vise. They protect the delicate pieces of my woodworking projects.

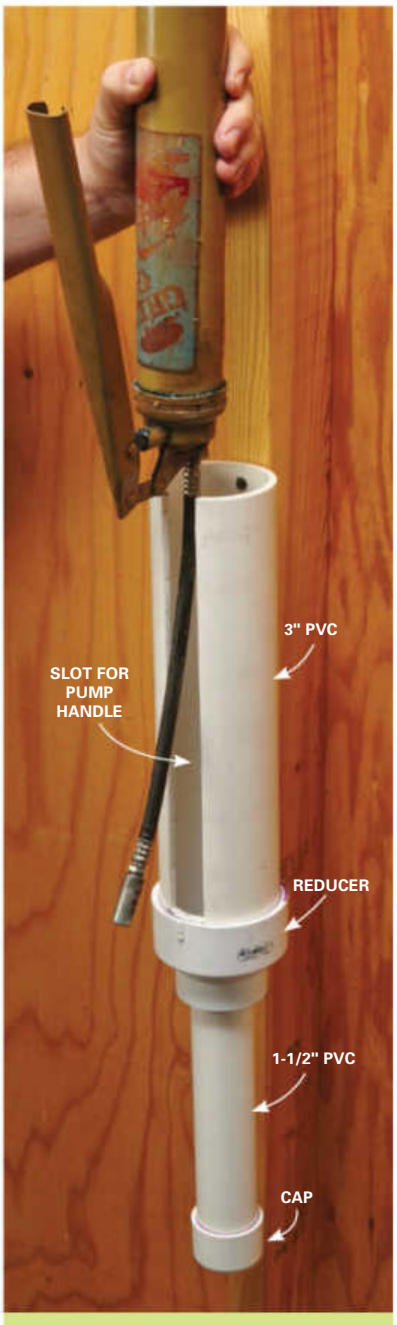
Rich Knight

READER PHOTO

Wheelbarrow leaf trapper

Moving leaves in a wheelbarrow is no fun. A couple of good bounces and your leaves are all over the ground again. To combat this, I took a 4-ft. piece of wire mesh fence and bent it around the top and sides of my wheelbarrow. Now I can load the wheelbarrow full of leaves and have them stay put as I wheel them to the compost pile.

Casey Hankins



Grease gun holder

A grease gun is handy to have in the garage, but storing it can be messy. There's always a bit of grease that wants to ooze from the tip of the hose. That's why I made this holder. I used 3-in. and 1-1/2-in. pieces of PVC drainpipe and a couple of fittings, including a cap to catch any drips. I also cut a slot in the holder to accommodate the pump's handle. The only tricky part was cutting the slot, which I did with my jigsaw.

Steve Goodrich

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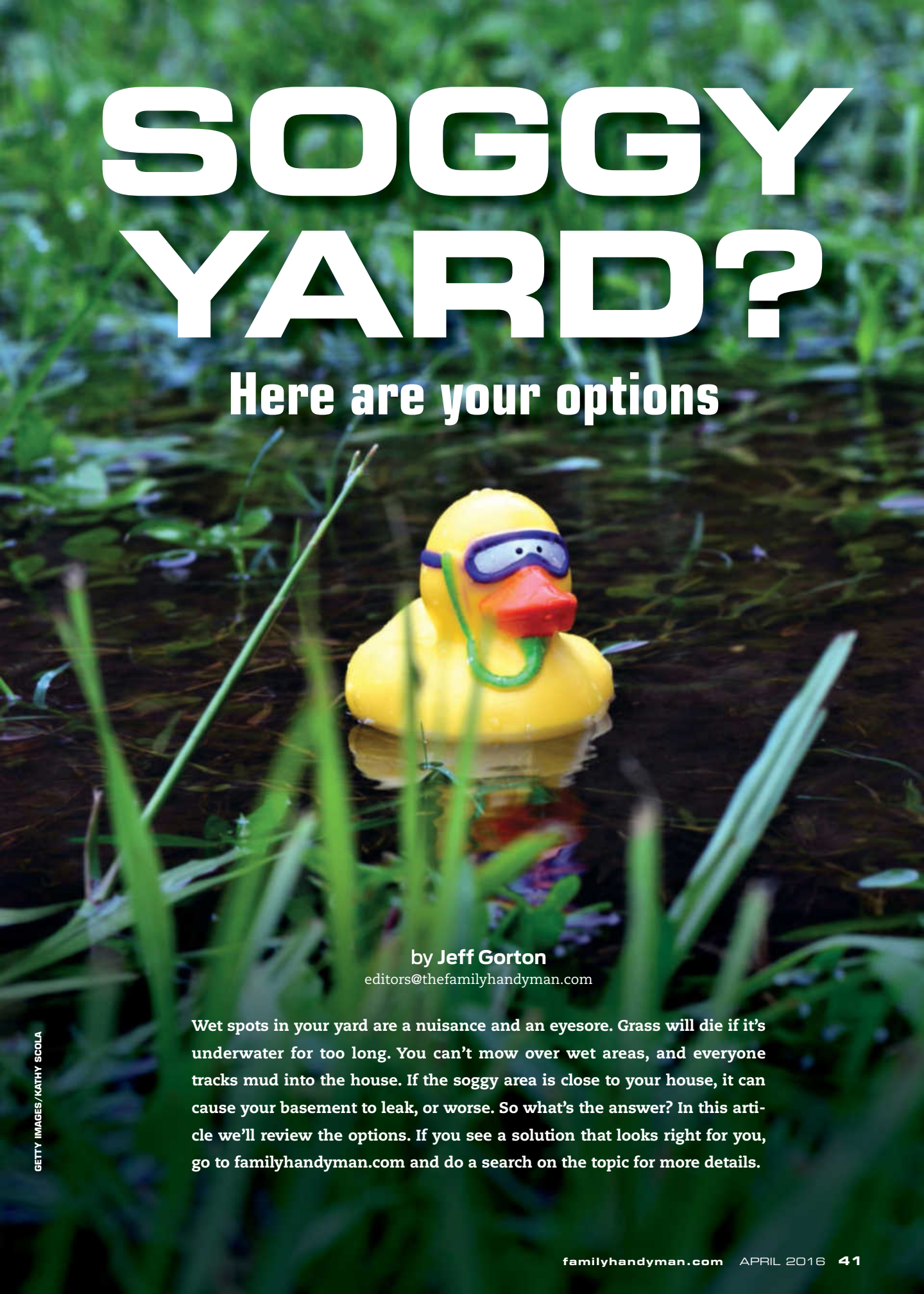
SOGGY YARD?

Here are your options



GETTY IMAGES/KATHY SCOLA

by **Jeff Gorton**
editors@thefamilyhandyman.com

Wet spots in your yard are a nuisance and an eyesore. Grass will die if it's underwater for too long. You can't mow over wet areas, and everyone tracks mud into the house. If the soggy area is close to your house, it can cause your basement to leak, or worse. So what's the answer? In this article we'll review the options. If you see a solution that looks right for you, go to familyhandyman.com and do a search on the topic for more details.

EXTEND THE DOWNSPOUT
Landscaping near the house can create a basin for water. Extending the downspout usually solves the problem.

TRY SIMPLE FIXES FIRST

Before you start digging a trench or taking some other drastic action to get rid of a wet spot, step back and survey the situation to see where the water is coming from. The problem could be as simple as a downspout or sump pump discharge that's draining into a low area of your yard. Redirecting your downspout or running the discharge pipe from your sump pump to a different location might be all you need to do.

DRAW A DRAINAGE PLAN

If you couldn't find a simple fix for your soggy yard dilemma, you'll need another strategy. Start by making a sketch of your property showing the house, driveway, patios, street and other features. Then use a line level, builder's level or some other leveling method to determine high and low spots. Draw arrows to show how water flows and make notes to indicate the relative height of high and low spots. Keep in mind that in most cases you shouldn't plan to direct water onto your neighbor's property. And if you're hoping to discharge water into the street or municipal storm sewer, contact the city first to see what regulations apply.

A sketch will help you decide which of the following strategies is best for your situation. For example, if you simply have no way to drain water from a low spot to another location, your best option may be to build a rain garden or dry well.

CONSTRUCT A CREEK BED

You can solve drainage problems and create an attractive landscape feature at the same time with a dry creek bed. Build a creek bed to direct water away from a low spot in your yard. Or if the slope of the ground permits it, use a creek bed to drain a low spot.

Start by making a swale—essentially a gentle, shallow drainage ditch. Then line it with gravel or stones and add interest with boulders, a bridge or plantings.

Of course, you don't have to turn your drainage project into a creek bed. A simple swale is an effective and subtle way to control surface water. Obviously it's easier to create a swale before you seed or sod your yard, but if necessary, you can cut out the grass with a sod cutter and replace it when you're done regrading.

CREATE A CREEK BED
A creek bed like this can channel water away from a low spot or direct runoff into a rain garden or dry well. With the right landscaping, the creek bed will look good even when it's dry.

ART DIRECTION **VERN JOHNSON** • PHOTOGRAPHY **HSP UNLESS NOTED** • ILLUSTRATION **AS NOTED**

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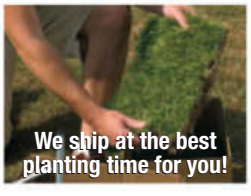

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BUILD A RAIN GARDEN

If you have a low spot in your yard that tends to collect and retain water, consider building a rain garden. A rain garden is simply an area of your yard that's designed to catch water and is filled with water-loving plants. It doesn't really solve a soggy yard problem, but a rain garden looks a lot better than a muddy hole. Plus, rain gardens are good for the environment. They reduce runoff and the lawn chemicals, pet waste and sediment that go along with it.

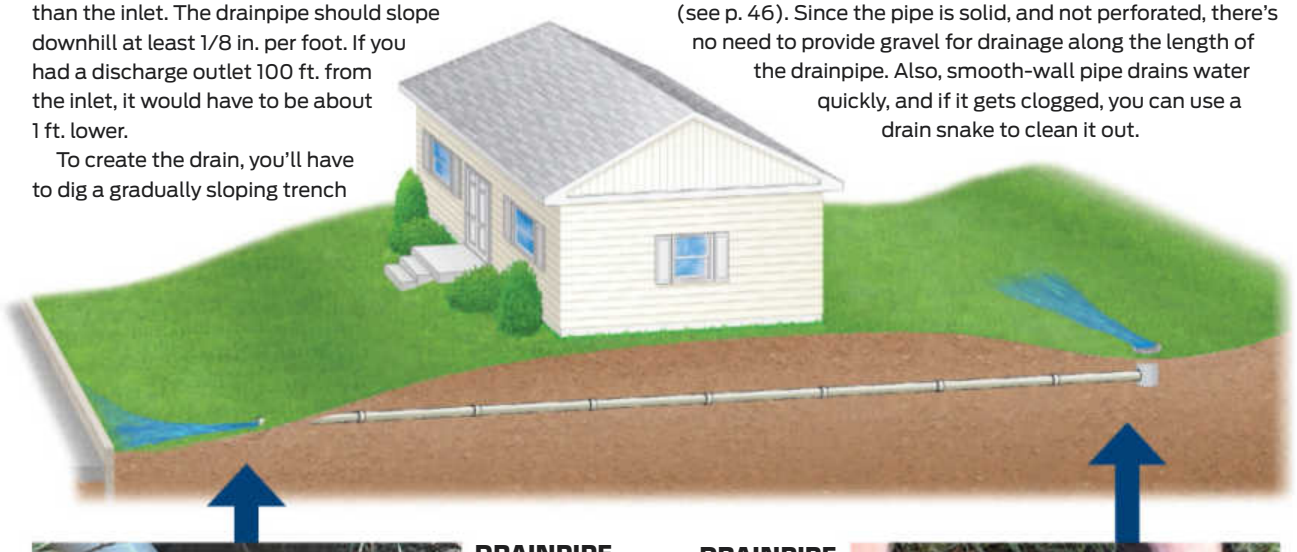
A rain garden doesn't have to hold water like a pond. You can add drainage and use the rain garden to hold the excess water until it has a chance to drain away. A key part of rain garden design is choosing the right plants for the soil conditions. Typically native plants with deep fibrous roots work well. Go to familyhandyman.com and search for "rain garden" to learn more about how to build one in your yard.

JOHN HARTMAN

ADD A DRAINPIPE

One of the best ways to get rid of water from a low spot is to simply drain it away through an underground pipe. For this to work, you need an area to discharge the water that's lower than the inlet. The drainpipe should slope downhill at least 1/8 in. per foot. If you had a discharge outlet 100 ft. from the inlet, it would have to be about 1 ft. lower.

To create the drain, you'll have to dig a gradually sloping trench from the source to the outlet. Then bury a plastic catch basin at the source and connect it to the discharge with PVC drainpipe. This system has a few advantages over a French drain (see p. 46). Since the pipe is solid, and not perforated, there's no need to provide gravel for drainage along the length of the drainpipe. Also, smooth-wall pipe drains water quickly, and if it gets clogged, you can use a drain snake to clean it out.



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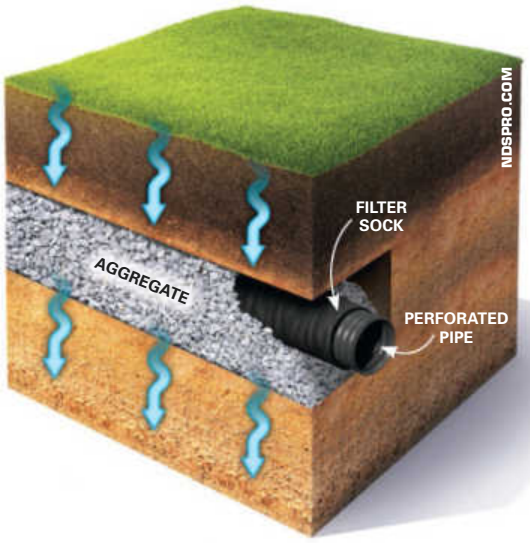
INSTALL A FRENCH DRAIN

A French drain is a versatile system for dealing with all kinds of drainage problems. It disperses water over a large area through a buried perforated pipe. The pipe must be surrounded by material that allows water to drain through. Conventionally this was gravel, but NDS sells a system called EZflow that includes the pipe and surrounding polystyrene aggregate in one convenient and lightweight package. A French drain system can be used alone or combined with a dry well.

A properly designed French drain system does not require an outlet. The water will simply soak into the soil as it flows along the perforated pipe. In fact, a French drain doesn't require an inlet on just one end either. You can construct the drain to accept water along its length, and disperse it underground.



ANATOMY OF A FRENCH DRAIN

A typical French drain consists of a perforated pipe—usually flexible lightweight plastic—sheathed by a fabric sock to keep dirt and sand from clogging the pipe. The pipe is buried in a trench and surrounded by aggregate. Water enters the pipe, from an inlet at one end, through the earth, or through long narrow grates spaced along its length, and is dispersed through the aggregate and into the ground.

INSTALL THE PIPE IN A TRENCH

Connect the lengths of tubing and place them over a bed of gravel. Then add gravel on the sides and over the top before covering the pipe. Perforated drainage pipe is also available with the sock in place.

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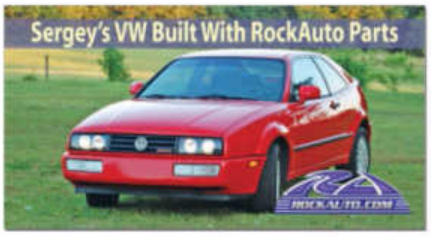

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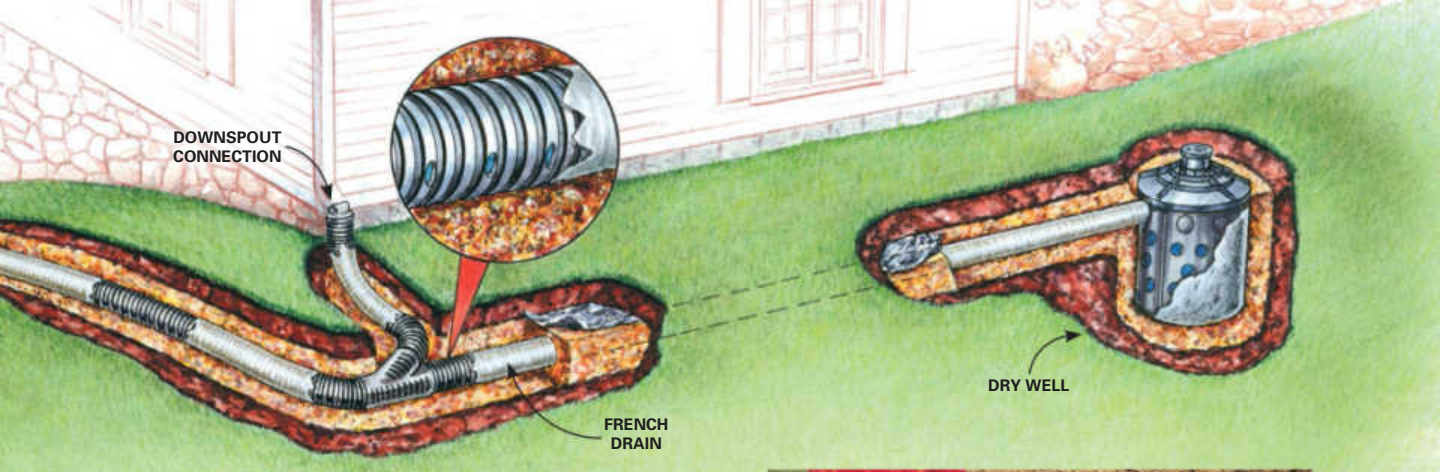

JOHN KEELY

CREATE A DRY WELL

A dry well is simply a large hole filled with gravel or some other aggregate that catches excess water and holds it while it soaks into the ground. You can increase the capacity of a dry well by burying special dry well barrels. These plastic containers collect water and hold it while it drains out through holes in the sides and bottom. The containers must be surrounded by gravel or another porous material to allow drainage. You can stack these plastic dry wells or place them side by side. In general, a dry well should be large enough to collect the first 10 or 15 minutes of a large rainstorm. Websites like ndspro.com provide guidance and calculators to help you determine the size of your dry well. You can also consult with a landscape contractor or soil engineer. You can increase the capacity of a dry well by connecting it to a French drain system. Search for "dry well" at familyhandyman.com.

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6 SILENT SIGNS YOUR HOUSE IS IN TROUBLE

by Mark Petersen
editors@thefamilyhandyman.com

We don't mean to scare you... well, actually we do. Recently, we sat down with a longtime home inspector, and he told us some tales and shared some photos that were downright frightening. Much of the damage he's encountered could have been prevented if the homeowners had just heeded the silent signs that their house was in trouble.

MEET THE EXPERT

Reuben Saltzman has been a home inspector since 1997 and is co-owner and president of Structure Tech, a home inspection company in St. Louis Park, MN.

GETTY IMAGES/JOSEFIN THELIN/EYEEM

SIGN: BULGE IN WASHING MACHINE HOSE

What it means: The hose is ready to burst

A bulging washing machine hose is an emergency. It may burst next year, next week or right now. But it *will* fail and it won't just leak—it will gush. In just a few minutes, it can do thousands of dollars in damage.

What to do: Replace rubber hoses with braided stainless steel

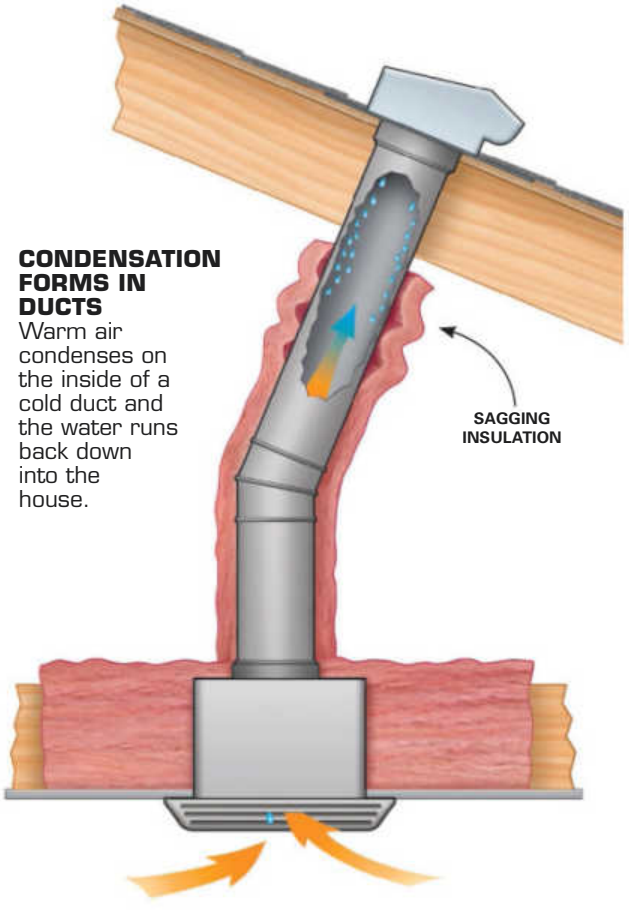
Immediately turn off the valves connected to the hoses. Before your next load of laundry, you'll need to replace the hoses. New hoses will cost you just $20.

While you're at the home center picking up your new hoses, invest another $10 in a pressure gauge that hooks onto a spigot or laundry room faucet. Your rubber hoses may have bulged because your water pressure was too high. It shouldn't be more than 80 psi. If it is, install a pressure-reducing valve (PRV) before you damage other appliances and fixtures in your house. If you already have a PRV, it may be set too high or due for replacement.

SIGN: STAINS AROUND A BATH FAN

What it means: Condensation is forming inside the duct

The stain could be caused by a roof leak, but condensation inside the duct is the most likely cause. If you live in a cold climate, there's a good chance that the warm, moist air from the bathroom is condensing inside the duct and the water is seeping back down into the fan housing. It's soaking the drywall around the fan and may be ruining your fan motor or even the framing components in your attic.



CONDENSATION FORMS IN DUCTS
Warm air condenses on the inside of a cold duct and the water runs back down into the house.

What to do: Investigate, insulate and run the fan longer

Start by checking the damper inside the fan housing and the one on the vent outside. Vents are usually on walls or roofs, but sometimes they're in the soffits. A stuck damper can lead to heavy condensation.

A bath fan duct that's not insulated (or poorly insulated) gets really cold in the attic. A cold duct filled with warm moist air is a recipe for condensation. On exceptionally cold days, that condensed water freezes and then drips back down when the temperature rises.

Even insulated ducts get cold enough for condensation to form when the fan first starts up. If a fan is run long enough, the duct will warm up and dry out. Consider replacing the wall switch with a timer switch, which will run the fan for a set period of time.

INSULATE THE DUCT
You could wrap the existing duct in insulation, but it's usually easier to replace it with a duct prewrapped in an insulated jacket. To see how, search for "bath fan" at familyhandyman.com.

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21259553

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We have invested millions of dollars in our own state-of-the-art quality test labs and millions more in our factories, so our tools will go toe-to-toe with the top professional brands. And we can sell them for a fraction of the price because we cut out the middle man and pass the savings on to you. It's just that simple! Come visit one of our 600+ Stores Nationwide.

WOW SUPER COUPON
2.5 HP, 21 GALLON, 125 PSI VERTICAL AIR COMPRESSOR
LOT 69091/61454
61693/62803
67847 shown

CENTRALPNEUMATIC
Customer Rating

SAVE $349

$149.99
~~$179.99~~
comp at $499

21263662

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 7/8/16. Limit one coupon per customer per day.

SUPER COUPON
26", 4 DRAWER TOOL CART
Customer Rating

US★GENERAL

LOT 95659 shown
61634/61952

$99.99
comp at $349.99

• 580 lb. capacity

SAVE $250

21281125

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SUPER COUPON
1500 WATT DUAL TEMPERATURE HEAT GUN (572°/1112°)
drillmaster
LOT 62340
62546/63104
96289 shown

SAVE 70%

$8.99
comp at $29.97

21311096

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SUPER COUPON
14" OSCILLATING SPINDLE SANDER
CENTRAL MACHINERY
LOT 95088/62146
69257 shown

SAVE $70

$99.99
comp at $169.99

21317199

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WOW SUPER COUPON
RAPID PUMP® 3 TON LOW PROFILE HEAVY DUTY STEEL FLOOR JACK
PITTSBURGH
LOT 68049/62326
62670/61253
61282 shown

Customer Rating

• Weighs 73 lbs.

SAVE $85

$84.33
~~$99.99~~
comp at $169.99

212566322

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SUPER COUPON
27 LED PORTABLE WORKLIGHT/FLASHLIGHT
Batteries included.
LOT 67227 shown
69567/60566/62532

SAVE 58%

$2.99
comp at $7.15

21251987

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WOW SUPER COUPON
12" SLIDING COMPOUND DOUBLE-BEVEL MITER SAW WITH LASER GUIDE
CHICAGO ELECTRIC POWER TOOLS
LOT 69684 shown
61969/61970

SAVE $263

$135.55
~~$194.99~~
comp at $399

21271133

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SUPER COUPON
29 PIECE TITANIUM NITRIDE COATED HIGH SPEED STEEL DRILL BIT SET
LOT 61637 shown
5889/62281

SAVE 75%

NEW

$14.99
comp at $59.97

21284013

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SUPER COUPON
2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL
Customer Rating

LOT 61258 shown
61840/61297/68146

BADLAND

$59.99
comp at $259.99

SAVE $200

21315973

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SUPER COUPON
72" x 80" MOVING BLANKET
HaulMaster
LOT 66537 shown
69505/62418

SAVE 66%

$5.99
comp at $17.97

Customer Rating

21251083

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SUPER COUPON
UNIVERSAL TOOL STAND
LOT 46075/69805 shown
CENTRAL MACHINERY

SAVE $105

$29.99
comp at $134.99

• 500 lb. capacity

21262727

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SUPER COUPON
4 PIECE 1" x 15 FT. RATCHETING TIE DOWNS
LOT 61524/60405/62322/63056
63057/63094/90984 shown

Haul Master

$7.99
comp at $20.37

SAVE 60%

21276300

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SUPER COUPON
4000 PEAK/3200 RUNNING WATTS 6.5 HP (212 CC) GAS GENERATORS
PREDATOR GENERATORS
LOT 63079/63080/69729/69676 shown
LOT 69728/69675/63090/63089
CALIFORNIA ONLY

SUPER QUIET

• 70 dB Noise Level

$289.99
comp at $469

SAVE $179

21302051

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SUPER COUPON
DOVETAIL JIG
Customer Rating

LOT 34102

$27.99
comp at $57.98

WINDSOR DESIGN

SAVE 51%

21291466

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SUPER COUPON
4" BISCUIT PLATE JOINER
CHICAGO ELECTRIC POWER TOOLS
LOT 68987

Customer Rating

$44.99
comp at $179

SAVE $134

21311046

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SUPER COUPON

FREE

WITH ANY PURCHASE

PITTSBURGH
1" x 25 FT. TAPE MEASURE
LOT 69031
69030 shown

$4.97 VALUE

LIMIT 1 - Cannot be used with other discount, coupon or prior purchase. Coupon good at our stores, HarborFreight.com or by calling 800-423-2567. Offer good while supplies last. Shipping & Handling charges may apply if not picked up in-store. Non-transferable. Original coupon must be presented. Valid through 7/8/16. Limit one FREE GIFT coupon per customer per day.

21365885

WOW SUPER COUPON

RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE

CENTRAL PNEUMATIC

LOT 93897 shown
69265/62344

SAVE $106

Customer Rating

$59.99 ~~$89.99~~

comp at $166

21371898

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SUPER COUPON

SAVE $100

2-IN-1 FLOORING NAILER/STAPLER

LOT 97586/69703
61689 shown

CENTRAL PNEUMATIC

Customer Rating

WE CARRY A FULL LINE OF FASTENERS

$99.99

comp at $199.99

21319311

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SUPER COUPON

CENTRAL MACHINERY

2 HP INDUSTRIAL 5 MICRON DUST COLLECTOR

Customer Rating

SAVE $210

- 70 Gallon capacity

LOT 61790
97869 shown

$169.99

comp at $379.99

21369756

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SUPER COUPON

SAVE $90

CENTRAL MACHINERY

10", 12 SPEED BENCHTOP DRILL PRESS

LOT 62408/60237 shown

$109.99

comp at $199.99

21378701

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SUPER COUPON

ALUMINUM OXIDE SANDING SPONGES PACK OF 10

Lifetime Carbide

COARSE
LOT 46751

MEDIUM
LOT 46752

FINE
LOT 46753

SAVE 78%

YOUR CHOICE $3.99

comp at $18.27

21326725

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SUPER COUPON

6" DIGITAL CALIPER

PITTSBURGH

LOT 47257 shown
61585/62387

SAVE 63%

$10.99

comp at $29.99

Customer Rating

Includes two 1.5V SR44 button cell batteries.

21350150

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SUPER COUPON

11 PIECE WOOD CARVING SET

WINDSOR DESIGN

LOT 60655/62673 shown

Customer Rating

SAVE 33%

$5.99

comp at $8.99

21367836

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SUPER COUPON

US GENERAL

26", 16 DRAWER ROLLER CABINET

LOT 61609/67831 shown

- 1060 lb. capacity
- 14,600 cu. in. of storage

Customer Rating

$319.99

comp at $952.99

SAVE $633

21370216

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WOW SUPER COUPON

drillmaster

4-1/2" ANGLE GRINDER

LOT 95578/69645
60625 shown

SAVE 59%

$11.99

comp at $29.97

~~$14.99~~

21368259

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SUPER COUPON

50" CLAMP AND CUT EDGE GUIDE

Tools sold separately.

PITTSBURGH

LOT 66581

SAVE 67%

$15.99

comp at $49.95

21336975

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SUPER COUPON

2.5 HP 12" THICKNESS PLANER

CENTRAL MACHINERY

LOT 62555/95082 shown

SAVE $63

$239.99

comp at $302.99

21348029

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SUPER COUPON

1/4" TRIM ROUTER

drillmaster

LOT 61626/62659
44914 shown

SAVE $79

Customer Rating

$19.99

comp at $99

21357729

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SUPER COUPON

9 PIECE FULLY POLISHED COMBINATION WRENCH SETS

Customer Rating

PITTSBURGH

SAVE 66%

SAE
LOT 69043/42304 shown

METRIC
LOT 42305/69044

YOUR CHOICE $5.99

comp at $17.97

21371495

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SUPER COUPON

CENTRAL MACHINERY

4" x 36" BELT/ 6" DISC SANDER

LOT 62502
97181 shown

Customer Rating

SAVE $84

$59.99

comp at $144.10

21374143

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SUPER COUPON

60 LED SOLAR SECURITY LIGHT

Includes 6V, 900 mAh NiCd battery pack.

Bunker Hill Security

LOT 62534/69643 shown

Customer Rating

SAVE 54%

$31.99

comp at $69.99

21323421

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SIGN: EFFLORESCENCE ON CHIMNEY BRICK

What it means:
Too much moisture inside the chimney

Efflorescence is the white material that appears on brick. It occurs when moisture moves through masonry. That moisture picks up minerals and leaves them behind in the form of tiny crystals. The minerals themselves do no harm, and a small amount of efflorescence is common. But heavy efflorescence on your chimney is a cause for concern. It's a sign of moisture inside the chimney—and when that moisture freezes, it can slowly wreck the chimney from the inside out.

Even more alarming, your flue liner could be cracked or broken, and deadly combustion gases from your furnace, fireplace or water heater may be leaking into your home.

What to do:
Fix the crown or call an expert

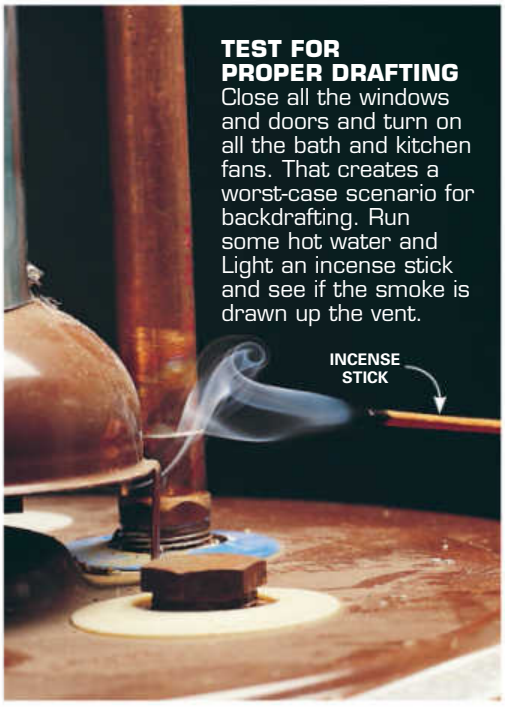
Immediately have your chimney inspected by a licensed chimney sweep certified by the Chimney Safety Institute of America (CSIA). Search for "chimney" at familyhandyman.com for instructions on how to repair a crown and additional chimney maintenance tips.

CRACKS IN THE CROWN ALLOW WATER IN
Water that gets inside the chimney through cracks in the crown can cause efflorescence and damage the bricks.

SEAL THE CROWN
Small cracks in the crown can be sealed with an elastomeric masonry sealer, but a crumbling crown will have to be replaced. Smear on the sealant by hand, then smooth it with a brush.

SIGN: MELTED GROMMETS ON WATER HEATER

BAD VENTS CAUSE BACKDRAFTING
Water heater vents need to slope upward at least 1/4 in. per foot. The installer responsible for this down-sloping vent apparently didn't know that hot gases rise.



TEST FOR PROPER DRAFTING
Close all the windows and doors and turn on all the bath and kitchen fans. That creates a worst-case scenario for backdrafting. Run some hot water and Light an incense stick and see if the smoke is drawn up the vent.

What it means: Deadly gases may be entering your home

Exhaust from a gas water heater is supposed to flow through a duct and out of the house. But sometimes, exhaust doesn't flow up and out. Instead, it "backdrafts," spilling deadly carbon monoxide into the air you breathe. One sign of backdrafting is damaged plastic grommets on top of the water heater, melted by the hot exhaust. This shows that your water heater has backdrafted badly on at least one occasion—and you must take action.

What to do: Get carbon monoxide alarms

Sometimes, the cause of backdrafting is obvious: A vent pipe may be disconnected from a vent hood, for example, or a vent may slope downward. But even a properly installed vent might occasionally backdraft because of high winds or other unusual circumstances. So the surest way to protect your family is to install carbon monoxide alarms. If you don't have CO alarms in your house, go get them today.

Install one on every level, outside sleeping areas, and within 5 ft. to 20 ft. of any sources of CO, such as water heaters, furnaces and fireplaces. If an alarm ever goes off, get out of the house immediately and call the HVAC repair service to correct the problem. The symptoms of CO poisoning are dizziness, headaches and vomiting. If anyone in the house is experiencing these symptoms, leave the house and call the fire department.

CARBON MONOXIDE ALARMS SAVE LIVES
Every home with an attached garage, fireplace or gas appliances should have carbon monoxide alarms. If you already have them, be sure to test and maintain them according to the manufacturer's instructions.

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Captures 99% of the waste BEFORE it reaches your shop vacuum!
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99% of Dust Here.
Wet or Dry.
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Vacuum Not Included.
Oneida Air Systems
Dust Deputy® Now Available at these fine retailers.
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MENARDS® Dedicated to Service & Quality™
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Attaches to your shop vacuum.
Cleans while you're using it! All of the waste goes into your vacuum!
Pat. Pend.
Hose and cuff not included.
Oneida Air Systems
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1.800.732.4065 www.oneida-air.com

SIGN: DECKING DIRECTLY UNDER THE DOOR

What it means:
Rot could be wrecking your house

Decks that are built right up to the bottom of a door often mean trouble. Rainwater splashes off the deck up onto the door. That much water is hard to keep out. Even if the flashing holds up, water may eventually find its way through the door components. This can ruin the siding, door and interior flooring, or worse, destroy the rim joist and other framing components both inside and outside your home.

EXTERIOR DAMAGE
It's hard to properly flash a door when the deck boards are snug against it. Water can find its way behind the flashing and destroy the ledger and siding below it.

INTERIOR DAMAGE
Splashing rainwater can work its way through the door and leak into the house, damaging the rim joist below.

INSTALLING GUTTERS WILL HELP
If there's an overhang above the door, install gutters to divert the water that pours off the roof. To learn how, search "install gutters" at familyhandyman.com.

What to do:
Divert the water away

Diverting the water with gutters will help. However, the bottom line is that as long as the deck boards are up tight under the door, there's a chance of water infiltration. If you plan to build a deck, install it about 4 in. below the door threshold. And never let snow pile up against the door.

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Metal Carving
AWFS Visionary Awards Winner
MADE IN USA
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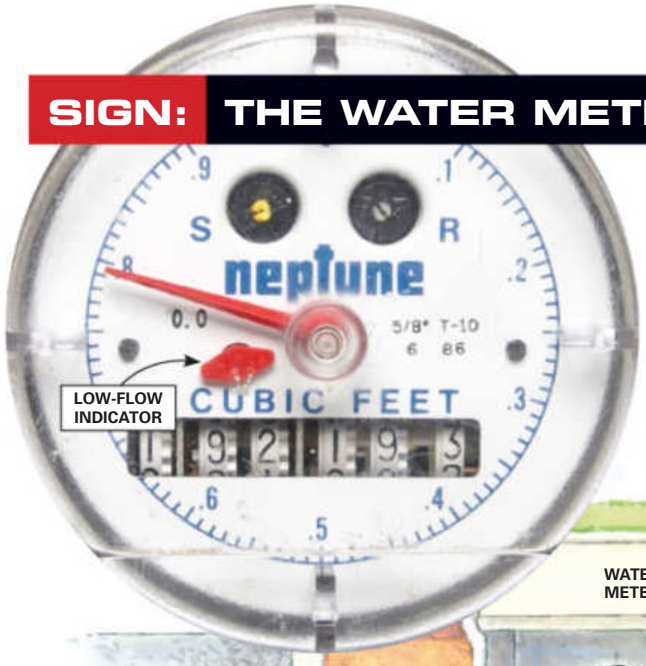
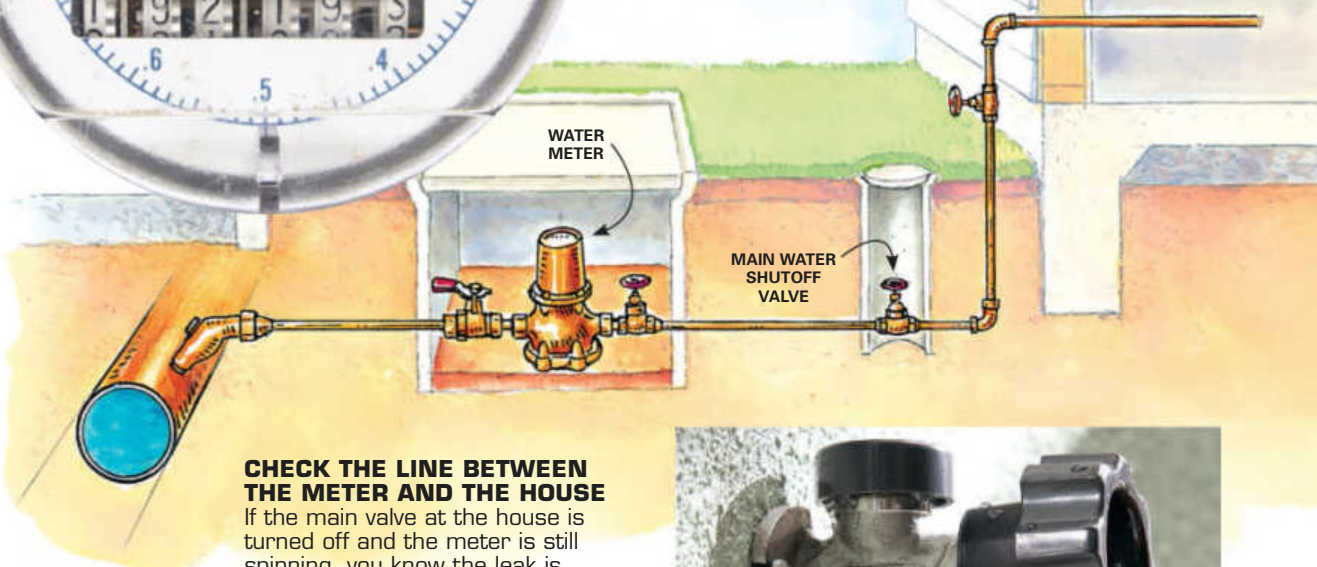
SIGN: THE WATER METER NEVER STOPS



What it means: You've got a leak

If all the faucets and plumbing fixtures in your house are turned off and the low-flow indicator on your water meter continues to measure running water, you're wasting water and money.



CHECK THE LINE BETWEEN THE METER AND THE HOUSE
If the main valve at the house is turned off and the meter is still spinning, you know the leak is between the meter and the house.

What to do:
Look for the leak

Indoor leaks usually create obvious signs. Look for water stains on walls or ceilings or a puddle on the floor. Also listen to toilets—a worn-out flapper on the flush valve creates a hiss and is a common cause of slow, constant water flow.

Outdoor leaks usually seep into the ground and can go on for years without being noticed. If your water meter is outside the house (warm climates only), the first step is to check the water line between the house and the meter. Shut off the main water valve at the house and check the meter. If it's still registering water flow, you know there's a leak between the meter and the house. Fixing this problem will likely require some excavation.

A leaking water spigot may go unnoticed if a hose is attached that runs out into the yard or garden. If you find one that keeps dribbling water, a new valve seat washer is probably the solution. If the spigot leaks at the top near the handle, replace the packing nut washer. To see how, search for "faucet repair" at familyhandyman.com.

Irrigation systems are another cause of hidden leaks. Check for irrigation leaks by shutting off the valve in the house that feeds the irrigation system. If the meter stops spinning, you've found the problem. Narrow the search even more by looking for wet spots in the yard or areas of grass that are especially green. A malfunctioning zone valve is usually the cause.

INSPECT THE SPIGOTS
Disconnect all the hoses and make sure the spigots aren't leaking.

CHECK YOUR SPRINKLER SYSTEM
A malfunctioning irrigation valve will allow water to continue to dribble out into the yard.

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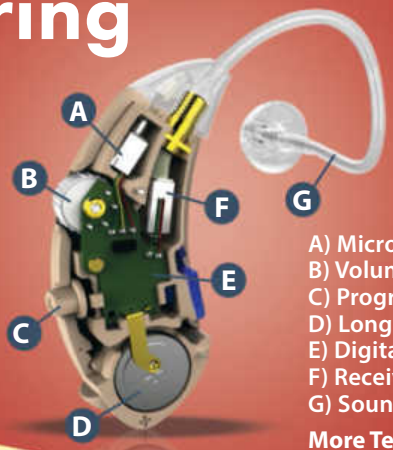

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- **100% Money Back Guarantee**

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Wonderful Company! "I will definitely recommend your company to my patients." **- Dr. Arun P.**

They Are Fantastic! "I just received my HCX hearing aids and they are fantastic. Advanced Affordable is far superior and far more affordable!" **- Chuck D.**

Studies Show That Hearing Aids May Help Prevent Dementia.

A study by Dr. Frank Lin at John Hopkins University, found that adults with hearing loss are significantly more likely to develop dementia and at a faster rate. Fortunately, using hearing aids is an effective way to treat hearing loss and may help you maintain healthy mental activity.

Read More Information At:
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DIY Quiz

BY TRAVIS LARSON editors@thefamilyhandyman.com

ART DIRECTION MARCIA ROEPKE • PHOTOGRAPHY HSP

Put on your thinking cap and take this month's quiz to see just how smart you are when it comes to DIY. Here's how it works:

- There are easy, intermediate and really tough questions all mixed together.
- There may be more than one correct answer!
- The answers are on pp. 90–91.Get your DIY rating on p. 90. Good luck!

1. What is this task called?
A. Bull floating
B. Flattening
C. Troweling
D. Screeding

2. True or False? Used motor oil works well as a substitute for bar chain oil in your chain saw.

3. What is this part of a window called?
A. Frame
B. Muntin
C. Parting stop
D. Sash

4. Why do some window manufacturers fill the space between two or three layers of insulated glass with argon?
A. Argon is molecularly bigger than the molecules composing air, making it less prone to leakage.
B. Argon is much cheaper than nitrogen.
C. Argon is denser than ordinary air, making it less thermally conductive.
D. All of the above.

5. True or False? The term "attic bypass" refers to the ventilation air that enters through the eaves and exhausts through various attic vents. It prevents ice dams and reduces cooling costs in the summer and heating costs in the winter.

6. Where are carbon monoxide alarms most needed?
A. The garage
B. Near the bedrooms
C. Near gas-burning appliances like clothes dryers, furnaces and water heaters
D. All of the above

7. **True or False? A pattern bit is for making patterns to create many identical, elaborate parts.**

8. **Why should you always store gasoline with a tight-fitting cap?**
A. The most volatile molecules evaporate quickly.
B. Moisture will find its way into the fuel.
C. If you've treated the fuel with stabilizer, it doesn't matter if the cap fits tight.
D. None of the above.

9. **On gas stoves with electronic ignitions, what is the most common reason a burner won't light?**
A. The gas line feeding the burner is plugged.
B. The orifices on the burner are plugged.
C. The igniter needs replacing.
D. The igniter is dirty.

10. **True or False? You should always call all your underground utilities before doing any digging in your yard. (You'll find the phone numbers you need on your utility bills or online.)**

11. **True or False? The best way to deal with grass clippings is to leave them on the lawn.**

12. **What's wrong with this picture?**
A. Table saws aren't designed for crosscutting, just ripping.
B. His hands should be reversed on the wood and miter gauge.
C. The wood can get wedged between the blade and the fence after the cut is complete, making it hard to remove without shutting off the saw.
D. You shouldn't use the fence when crosscutting. Dangerous kickbacks can occur.

13. **Why in the world would you cut a hole in the drywall when you install a countertop?**
A. To prepare for fishing wires for new backsplash outlets later.
B. It's an inspection hole to make sure there are no concealed wires.
C. The countertop is simply too long and it's a trick to make it fit. The tip of the countertop stays inside the wall.
D. The counter is being installed between two walls. This is a way to get it into place so you can scribe the end for fitting against the wall.

14. **The material being poured is called "SLC," which stands for:**
A. Self-leveling cement
B. Structural leveling compound
C. Self-leveling compound
D. Structural laticate cement

15. **True or False? Spark plug cables are just like extension cords. They either conduct electricity or they don't.**

Find the DIY Quiz answers on pp. 90–91.

BY RICK MUSCOPLAT editors@thefamilyhandyman.com

Stop patio door drafts!

ART DIRECTION MARCIA ROEPKE • PHOTOGRAPHY TOM FENENGA

Patio door weather-strip seals slowly degrade and wear, letting in small drafts that are barely noticeable. If you spent the winter kicking up the thermostat (or grabbing a blanket) just to be comfortable near the door, you've already wasted enough money on heat to buy several sets of weather-strip seals. If you open your patio door frequently or the door is exposed to sunlight, it pays to replace the weather stripping every 10 years. Spring is the perfect time to do this.

We bought all the seals for this early '90s Marvin sliding patio door for about $65 including shipping. Replacing the seals is a one-person job, but enlist a friend to help lift the heavy door in and out of the track. You just need a screwdriver, a hammer, hooks and picks, and a putty knife. The entire job takes just a few hours. Here's the process.

Find the make and model

Some patio door manufacturers engrave their logo on the door pull lock hardware, but others hide the branding and model information. If you can't find a manufacturer logo or model label, look along the door edges or jamb for a gold sticker from the American Architectural Manufacturers Association (AAMA). If you find the label, shoot a digital

1 UNSCREW AND REMOVE THE HEADER
Open the patio door so the sliding door is in front of the stationary section. Start removing the header screws from that end. As you reach the open part of the door, have a friend brace the movable door so it doesn't tip out. Then remove the entire header strip. (If the door trim overlaps the header strip, you'll have to remove it.)

2 TILT AND LIFT
Tilt the top of the sliding door out far enough to clear the frame. Then lift the door up and off the bottom track (get help—it's heavy). Set the door on a drop cloth and lean the door against a wall.

3 IDENTIFY AND LOCATE THE SEALS
The outer jamb seal is hard plastic with locking tabs and rubber sealing wings. The inner and track seals are made from a softer flexible material and are held in place with retainers.

4 REMOVE THE JAMB SEALS
Grab the outer jamb seal at the top and pull it off. Then pull the leaf seal out of the inner part of the jamb.

photo and go to aamanet.org and click on "certified products directory" to decipher the codes and get the brand and model information.

If you can't locate the label, copy the numbers on the metal strip between the panes of glass. Then go to igcc.org to decipher the codes. If neither approach works, or the manufacturer no longer sells replacement weatherstrip seals, you'll have to use off-the-shelf weather stripping and come up with a custom fix (see "If You Can't Find Factory Parts," p. 62).

Next, measure the stationary and movable sections. Take a digital photo of the entire door, track and jamb. Then contact the manufacturer's customer service/parts department to order replacement parts.

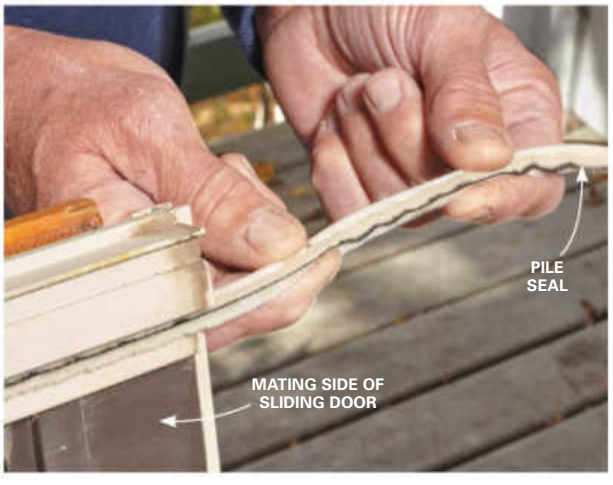
Remove the door

Most sliding patio doors tilt into the room from the top and then lift off the bottom track. The door is usually held in place with a removable header strip, which has to come off first. Brace the door or have a helper hold the door

5 REMOVE THE HEADER SEAL
Starting at one side, slide a hook or pick behind the header seal and pry it away from the wood. Then slide the pick along the header as you pull off the entire header seal.

6 CUT THE NEW SEALS
Using the old seals as templates, mark and cut the new seals to the proper length. Cut with a scissors, utility knife or hacksaw.

7 INSTALL THE NEW SEALS
Spread the locking tabs and snap the outer and header jamb seals into place. Push the inner leaf seal into the groove. Then slide the bottom seal into the track.



8 INSTALL NEW MATING SEAL
Slide the new pile seal into the groove on the mating side of the sliding door. Then attach new self-adhesive pile strips at the top and bottom of the stationary door.

upright while you remove the header retaining screws (**Photo 1**). Lean the door against a wall in a safe place after you lift it out of the track (**Photo 2**). The bottom rollers are usually dirty and the door latch can be greasy, so spread a drop cloth over carpeting to prevent stains.

Remove and replace the jamb, header, track and pile seals

Although weather-strip styles vary among manufacturers, this Marvin patio door is pretty common. The jamb has two seals: a hard plastic outer seal with locking tabs that snap into grooves on the jamb and a flexible "leaf" seal that's wedged into a groove on the inside part of the jamb (**Photo 3**).

Remove both jamb seals (**Photo 4**). Then remove the header seal (**Photo 5**). Next, cut the new seals to length and install them (**Photos 6 and 7**). Then replace the pile

If you can't find factory parts

If you can't locate manufacturer weather-strip seals in stores, try these sources:

- **amweatherguard.com**
- **biltbestwindowparts.com**
- **strybuc.com**
- **swisco.com**

If you've checked all online sources and still can't find an exact match, you'll have to improvise with off-the-shelf materials. V-seal can be used in place of factory jamb, header and track leaf seals. Just fold along the score line to form a "V." Remove the backing and stick it in place. Place EPDM foam rubber on the jamb and adjust the latch to accommodate the thickness. Use entry door seal strips to replace factory pile strips in mating areas.

seal on the stationary and sliding doors (**Photo 8**).

Clean and lubricate the bottom rollers using an all-purpose oil (**Photo 9**) and thoroughly clean the plastic or metal track that the rollers ride on. Then reinstall the sliding door and retaining header piece. Store your blanket in the linen closet—you won't need it anymore.

9 LUBRICATE THE ROLLERS
Clean the bottom rollers with a grease-cutting household cleaner. Then apply a few drops of oil to the roller axles. Wipe off the excess before installing the door.

TIP FOR REPLACING A SHUTOFF VALVE

When you replace a compression-style shutoff valve, it's always best to use a new compression sleeve. We showed you how to saw off the old sleeve in our Oct. '15 issue. But sawing through the sleeve without cutting into the copper tubing can be tricky, and sometimes you just don't have enough room to use a saw. That's where a compression sleeve puller earns its keep (one choice is the Pasco No. 4661; $25 at toolup.com). Crank out the screw and slide the jaw behind the compression nut. Then turn the screw until the pilot fits into the copper tubing. Continue turning until the sleeve slides off. That's it. Just slide on the new compression nut, sleeve and valve and then tighten.

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BY JASON WHITE editors@thefamilyhandyman.com

Mobile apps for DIY

ART DIRECTION MARCIA ROEPKE • PHOTOGRAPHY TOM FENENGA

Need some help with your next home improvement project? Well, thanks to smartphones and tablets, there's an app for that! Some apps are obviously geared toward DIYers and professional contractors. Others, not so much—but you might still find them useful around the house. Apps are available for either iOS (iPhone/iPad) or Android devices—or both in some cases. Here are some apps we love, and we think you'll love them too.

A level that fits in your pocket

Need a level right now? Download the free **iHandy Level**. It's great for helping you level small stuff like framed prints on walls. Just be sure to calibrate it for your smartphone before using it, which is done by setting it on a perfectly level surface and pushing a button.
Cost: Free
Compatibility: iOS and Android

More sawdust, less math

Like woodworking but hate trying to add fractions? **Fraction Calculator Plus** takes a lot of the head scratching out of your projects. All you do is punch the fractions you want to add into the calculator and "poof"... out comes the right answer.

Cost: Free ad-supported and paid versions (99¢ for iOS; $2.99 for Android)

Compatibility: iOS and Android

Plan, design and furnish your home

Thinking about new furniture, rearranging the living room or adding on? **Floor Plan Creator**, an Android tablet app, can help you with the design and layout. Start with the raw space and drag walls, windows, doors and furniture icons from the stock library. Then enter the size of each object to get a scaled view of the space. A stylus makes the app easier to use, but it works just fine without one.

Cost: Free

Compatibility: Android only

An engineer when you need one

The creators of **Home Improvement Calcs** claim it can do more than 170 types of calculations and unit conversions. It'll help you figure out things like how much concrete you need to fill a posthole or calculate the proper length and pitch for roof rafters.

Cost: $1.99

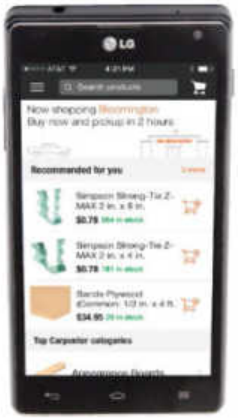
Compatibility: iOS only

DIY tips wherever you are

We might be a bit biased in our love for the **DIY Tip Genius** app, but that's because we made it! This app features clever ideas and project secrets from our experts here at *The Family Handyman*. It's sure to save you time, money and hassles. Download your free copy—it could mean the difference between a poorly done project and one you're proud of! OK, we're done bragging now.

Cost: Free

Compatibility: iOS and Android



Buying materials made easy

The Home Depot Pro app is designed for professional contractors, but it's great for advanced DIYers too. You can check a store's inventory from the job site and order your materials from the app, and the store will have everything bundled and waiting for you to pick up. Our lead carpenter loves it. There's also a version for non-pros. Similar apps are available for other home centers like Lowe's and Menard's.

Cost: Free

Compatibility: iOS and Android

Check the weather

You might not think of a weather app as a DIY tool, but just wait till the next time clouds are moving in and you still need to get a second coat of paint on the house. The **Dark Sky** app gives you hyper-local weather, radar and storm alerts. It's remarkably accurate and just the thing when you need to know exactly when the rain will start and stop in your precise location.

Cost: $3.99

Compatibility: iOS only

Top Ten TIPS

BY JEFF GORTON editors@thefamilyhandyman.com

Replacing a refrigerator

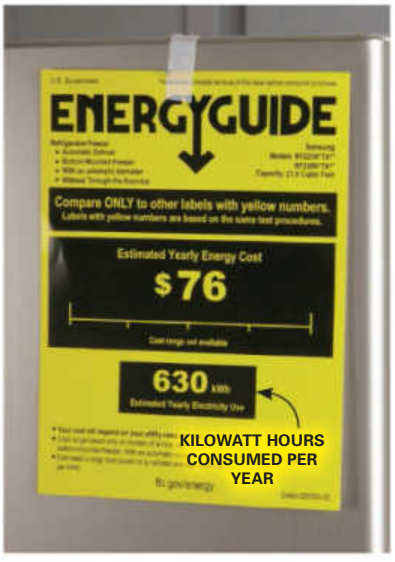
With all the different styles, colors and features available, shopping for a new refrigerator can be fun. But the excitement can turn into a real headache if you get your new refrigerator home and discover it doesn't fit or that the door won't open far enough to pull out the crisper drawers. A good appliance salesperson can help you choose the best style and features for your budget and lifestyle. But here are some tips to consider that probably won't be addressed at the store.

1 Make sure it'll fit!

Some appliances, like stoves and dishwashers, are made to fit standard-size openings in your cabinetry, but not refrigerators. You may find one the right width and then discover that it's too tall. To avoid surprises on delivery day, measure the width and height of the refrigerator space and jot it down before you go shopping. Allow at least an inch of extra space on all sides of the refrigerator for easy installation and adequate ventilation. Also make sure the new refrigerator will fit through doorways leading to the kitchen.

2 Check the EnergyGuide sticker

Use the EnergyGuide stickers to compare the annual operating costs of the refrigerators you're considering. Also, if you know how much your old refrigerator costs to run, you can figure out how much you'll save by buying a new, energy-efficient model. To do this, multiply the "estimated yearly electricity use" in kWh (kilowatt-hours) from the EnergyGuide sticker by the cost of your electricity per kWh. For example, if the tag shows an annual usage of 630 kWh and your electricity costs 8¢ per kWh, multiply 630 by .08 to arrive at an annual cost of $50.40.



3 See if parts are available

Before you purchase a refrigerator made in another country, check with your local appliance repair service to see if parts are readily available. Parts for some foreign-made appliances are expensive and hard to get. Also ask about repair costs for the model you're considering.

4 Find out what your old refrigerator is costing you

Buying a new, energy-efficient refrigerator can save you money. But to calculate your savings, you have to figure out what your old refrigerator costs to run. First, check your electric bill to see what the utility is charging you per kilowatt hour (kWh). This number will likely be 7¢ to 40¢ per kWh depending on where you live. Next, find out how much electricity your refrigerator is consuming. The most accurate method is to plug your refrigerator into a meter that records how many kilowatt-hours of electricity are consumed while the refrigerator is plugged into the meter. The Kill A Watt meter is $25 at amazon.com.

For example, let's say your electricity costs 10¢ per kWh, and your refrigerator consumes three kilowatt hours of electricity over a 24-hour period. Multiply the cost of your electricity (10¢) by the total kWh used (three) to arrive at 30¢. Your refrigerator costs 30¢ a day, or about $110 a year, to operate. Your results will be more accurate if you record usage for a longer period. You can also go to energystar.org and enter the model number into the Refrigerator Retirement Savings Calculator to find the average energy usage for your model.

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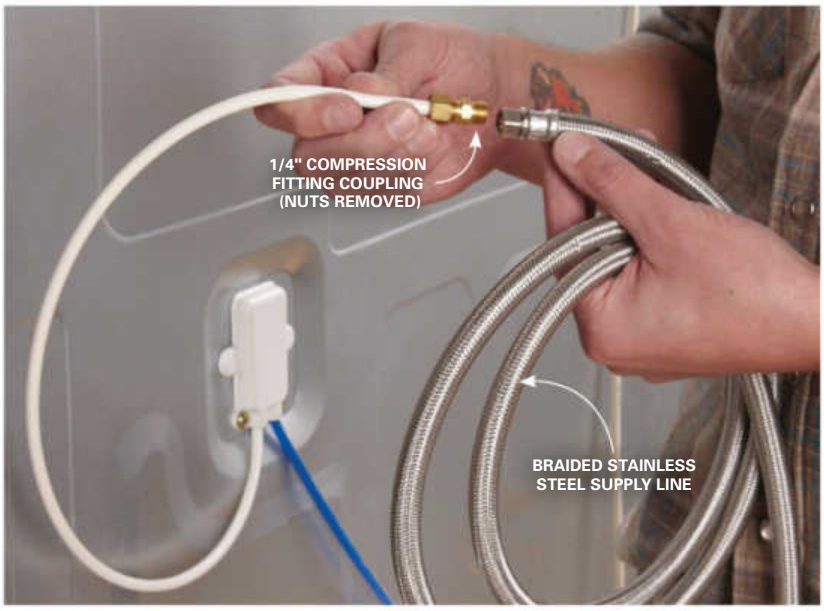
5 Ask about haul-away and delivery

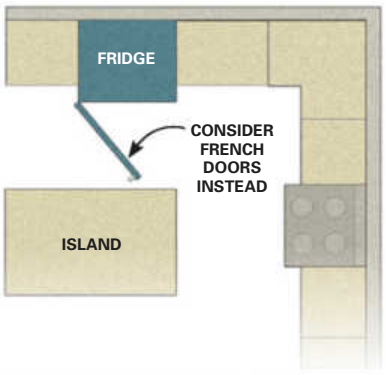
Moving a refrigerator in and out of your house can be a nasty task, especially if stairs are involved. When you buy your refrigerator, check to see if the cost of removing your old refrigerator and delivering the new one is included, and if not, what the charges will be. And don't forget that if you have an icemaker, you'll need to connect the water. Find out if this is included in the delivery cost.

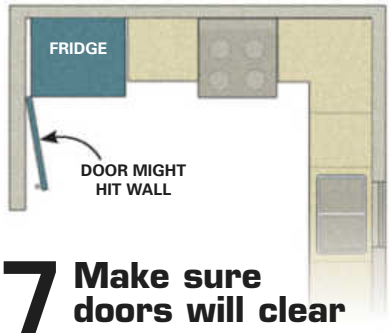


6 Use a braided stainless supply line

Refrigerators with icemakers or water dispensers require a water supply line. Plastic tubing is cheap and easy to install, but it's not rodent-proof and can get brittle as it ages. If it breaks or gets gnawed through, the leak can cause thousands of dollars' worth of damage. Quarter-inch soft copper tubing is a better choice, but it's more difficult to install and prone to kinking.

Braided stainless steel supply lines are the best choice because they're durable and easy to connect. Simply thread the nuts onto each end of your supply valve and refrigerator tubing. Rubber gaskets ensure a leak-free connection, and the stainless steel covering protects the supply line. The stainless steel lines cost $15 to $30 depending on the length. You'll need a 1/4-in. threaded male compression fitting at the refrigerator. If your refrigerator doesn't have this connection, you'll have to add a fitting.





7 Make sure doors will clear

When you're shopping for a new refrigerator, don't forget to plan for how the doors will open. If you have an island close to the refrigerator, or a narrow kitchen, smaller French doors or double doors may be a better choice. If the refrigerator is against a wall, make sure you have enough clearance so the door can open completely. Otherwise you may have trouble opening interior drawers or removing them for cleaning. And remember that single refrigerator doors can swing in either direction depending on which side the hinges are on. Most refrigerator doors are reversible, but it's much easier to order the refrigerator with the correct door swing than to change it yourself.

8 Ask about smudge-free stainless steel

If you hate trying to keep your stainless steel appliances looking shiny, ask about new easy-to-clean finishes. Some brands offer stainless steel lookalikes that have the added advantage of holding refrigerator magnets. Others offer special types of stainless steel that resist smudges and are much easier to clean.

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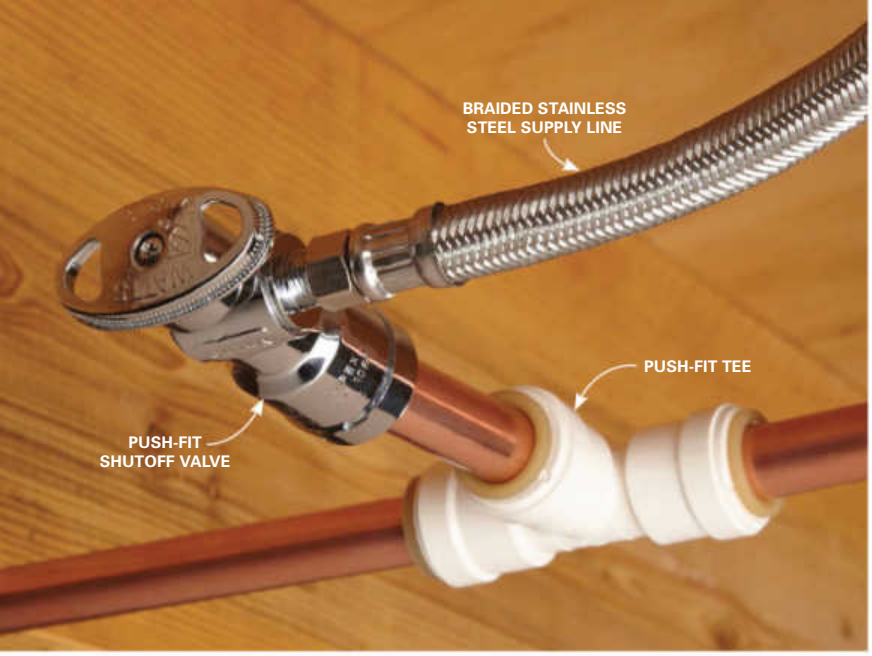


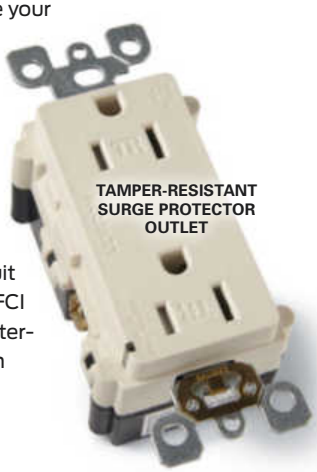
9 Don't use a saddle valve

Most icemaker connection kits include a saddle valve for connecting the icemaker supply line to your home's copper water pipe. Saddle valves are easy to install, but they're unreliable and prone to leaking. Instead, add a tee and a shutoff valve. If the connection isn't concealed in a wall or ceiling, you can avoid soldering by using push-fit connectors and push-fit valves like the ones shown here.

10 Protect your refrigerator

Power surges are fluctuations in voltage that can damage or degrade the electronics in your new refrigerator. Large power surges like those caused by lightning strikes can literally fry electronics, but even small surges originating from motors inside your house can cause cumulative damage to delicate electronics. And most new refrigerators have expensive, vulnerable circuit boards.

The best insurance against power surges is to replace your refrigerator outlet with a new surge protector outlet. Electrical codes may also require that the new outlet be protected by a GFCI (ground-fault circuit interrupter) and AFCI (arc-fault circuit interrupter). Check with your inspections department.



WHILE SOME WAGE HOT WATER WARS, RINNAI FAMILIES HAVE DECLARED PEACE.

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What homeowners MUST know

BY GARY WENTZ editors@thefamilyhandyman.com

TRIM BACK BUSHES

Shrubs and trees touching your house seems harmless enough. But it's not. Leafy branches keep the siding damp, which promotes mold growth, rot and peeling paint. They also provide an attractive path for ants and other pests, which may decide to nest inside walls. They can even rub the paint off siding as wind drives them back and forth. So prune the branches back at least 6 in. from the house.

DON'T OVERLOAD YOUR WASHER OR DRYER

You may save a little time, water or energy by cramming more clothes into your washer and dryer. But overloading any washer or dryer can damage motors, belts and other moving parts. So in the long run, overloading is an expensive bad habit.

Think twice before filing an insurance claim

Filing an insurance claim almost always means higher premiums in the future. So it might be smart to pay for the repair out of your own pocket. Here's a general rule: If the total repair bill will be less than your deductible plus $1,000, don't file a claim. Be especially careful with water damage claims. Water damage is a red flag to insurance companies since it hints at mold abatement costs or chronic plumbing problems and future damage.

ART DIRECTION MARY SCHWENDER • PHOTOGRAPHY HSP • ILLUSTRATION STEVE BJÖRKMAN

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Grout is hard to keep clean because it's porous. So when you finally get grout clean, your next step should be to seal it. Grout sealer plugs tiny pores, repels future stains and make regular cleaning easier. The life span of sealer depends on its location and quality. On a kitchen backsplash, a good sealer will repel stains for a few years. In a shower that gets daily use, you may need to reseal every year.

Tighten coax connections

Finger-tight coax connections don't provide a solid path for the signal and often loosen over time. So after tightening with your fingers, give the nut an extra quarter-turn with a wrench.

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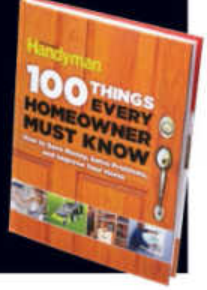

Tub and shower makeover

When tub or shower fixtures grow old and ugly, most people go shopping for a new faucet, then call a plumber. But you can skip that expense by leaving the faucet valve in the wall and replacing the visible parts only. Tub and shower "trim kits" come in a huge range of styles; some are available at home centers, many more online. Just make sure the kit you buy will work with the brand and model of your existing faucet.

STORE ON A DOOR

A door that opens into a closet or utility room provides a handy surface for hang-up storage. The trouble is that most doors don't offer a flat, solid surface for fastening hooks or racks. The solution is to screw 3/4-in. plywood to the door. (On a hollow-core door, use screws *and* construction adhesive.) Then you can mount as many hooks or racks as you like.

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BY RICK MUSCOPLAT editors@thefamilyhandyman.com

Fix a "no-start" small engine

When a small engine won't start, the usual suspects are bad gasoline, a corroded or plugged carburetor, or a bad ignition coil. You can fix any of these problems yourself easily, cheaply and quickly. You'll not only save lots of money but also skip the hassle of hauling your lawn mower, snow blower, pressure washer or whatever to a service center *and* home again.

Typical professional repairs start at about $100. But if you do the work yourself and order the replacement parts online, you can usually save enough to justify replacing parts even if you're not sure they're bad. (Psep.biz is one source of discount small-engine parts.) We'll cover a few basic tests, explain how to order parts and show you how to replace a carburetor, an ignition coil and a recoil starter. You can replace any defective parts in just a few hours with basic hand tools.

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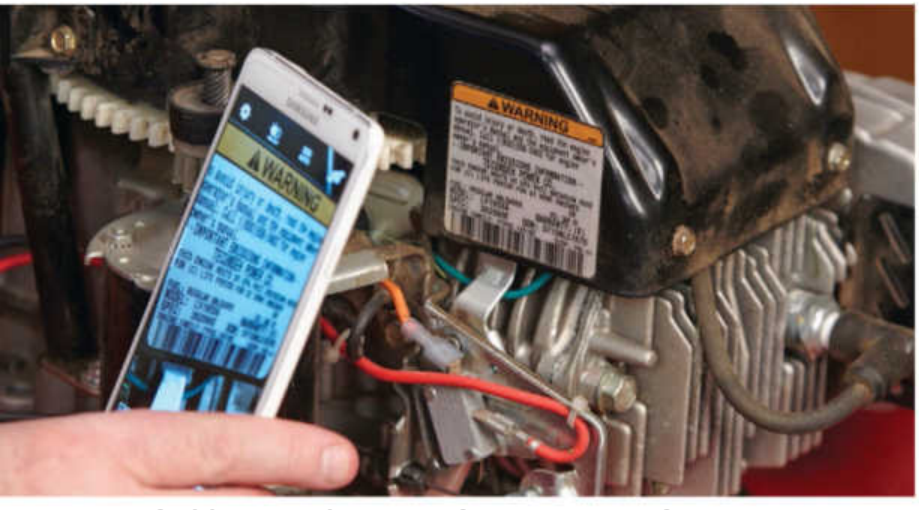
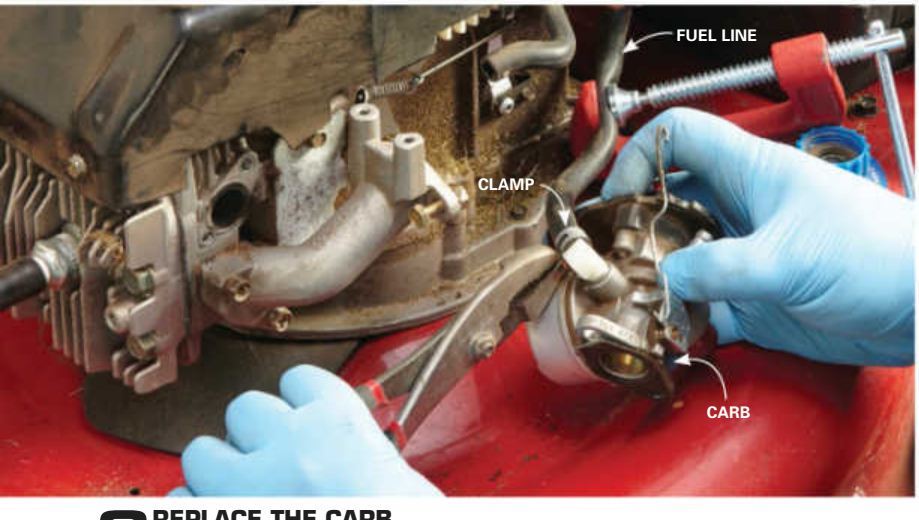
1 GIVE IT A BLAST OF "FUEL"
Remove the air filter and shoot a one-second burst of an aerosol petroleum-based lubricant (not starting fluid, silicone or Teflon spray) directly into the carburetor throat. Try starting. If the engine starts and then dies, that confirms you've got a fuel problem.



2 SHOOT THE MODEL AND SERIAL NUMBERS
Shoot a digital photo of the engine model and serial numbers and date of manufacture, as well as any other engine data on the label. You'll need that info to order parts.



3 REPLACE THE CARB
Tighten a C-clamp on the gas line or turn the shutoff valve to Off. Then remove the fuel line and two carburetor hold-down bolts. Rotate the carburetor to disconnect the throttle linkage. Reverse the procedure to install the new carburetor.

Check the basics first

Engine problems may have their root in something very simple. If your machine has a shutoff valve, check that first to make sure it's in the On position. Next, make sure the engine has fresh gas. If the gas is more than 30 days old, replace it with fresh, stabilized gas. Next, check the air filter to make sure it's not clogged.

If the tank has fresh gas and you've primed the carburetor and set the choke but it still won't start, it's time to remove the spark plug. If the spark plug is wet with gas, it proves the engine is getting fuel. Dry off the plug with compressed air and examine it for signs of carbon buildup or oil deposits. Check the gap to make sure it's within specs. If you have any doubts about the plug's condition, replace it—they're cheap.

If the plug is dry, it's a sign of a fuel problem and most likely a messed-up carburetor. Shoot a substitute fuel (WD-40 or PB Blaster Lawn Mower Tune-Up) into the carburetor throat and then try starting the engine (**Photo 1**). If it won't start or fire with spray fuel, you probably have an ignition system problem, most likely a bad ignition coil. However, if it starts and dies, that proves the ignition is working and the problem is fuel starvation.

Check the fuel filter first by disconnecting the fuel line from the filter to the carb. Gas should run out. If it doesn't, replace the filter. If gas flows freely through the filter, then the problem is inside the carburetor.

Testing an ignition coil is a bit trickier. To do it right, you need a small-engine spark tester. Holding the spark plug boot close to the engine to check for spark isn't a reliable test because a bad coil can produce a spark in open air but fail when the cylinder is under compression. If you own several small engines, it may pay to buy a tester. (One choice is the Briggs & Stratton No. 19368; $22 at repairclinic.com.) To learn how to use it, go to familyhandyman.com and search for "ignition coil." However, since the tester costs almost as much as a new coil (about $45), replacing the coil without testing may be the way to go.

Find the right parts

Lawn and garden tool manufacturers often use several different engine brands for a certain model, so you can't

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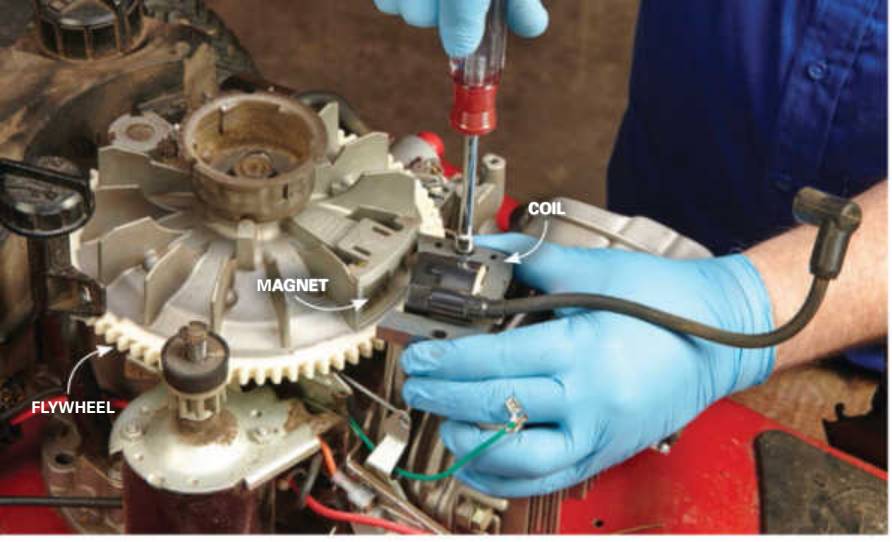


4 REMOVE THE OLD COIL
Remove the two coil retaining screws. The instant they're loose, the coil will snap against the magnet on the top of the crankshaft. Grab the coil and yank it off the magnet.

5 INSTALL THE NEW COIL
Set the new coil in place and snug the retaining screws, but don't tighten them all the way. Align the crankshaft magnet to the center of the coil. Set the air gap using a business card as a gauge. Move the coil in and out until you feel a slight drag on the card. Then tighten the coil screws. Check the gap again. If it's right, reinstall the engine shield and cover.

6 REPLACE THE RECOIL STARTER ASSEMBLY
Remove the engine cover retaining screws and lift the cover off the engine. Next, remove the recoil assembly hex-head screws. Then lift off the old unit and drop in the new one. Reverse the procedure to reinstall.

buy parts based on the model number of the mower or snow blower. Instead, you need the engine model and serial number and the date of manufacture to find the parts. This Toro lawn mower, for example, was built with a Tecumseh engine, while a different Toro mower may be built with a Briggs & Stratton engine. We found the Tecumseh engine information on a label (**Photo 2**). But other brands may stamp the numbers into the engine block, valve cover or engine shield.

Once you have the engine information, locate a parts list and exploded diagram by entering the brand and model number into a search engine. Find the engine manufacturer's part number and enter that into a search engine to find the lowest price or nearest seller.

Carb rebuild vs. new carb

These days we don't recommend rebuilding a carburetor. First, a brand new carburetor from a discount online seller usually costs less than a rebuild kit and a bucket of carburetor soaking solution. Plus, rebuilding a carburetor is time consuming and doesn't always work, especially if the internal parts are corroded.

Once you have the new carburetor in hand, remove the old one and swap in the new unit (**Photo 3**). After you reinstall the fuel line and prime the engine, it should start right up.

Replace an ignition coil

If you've determined that you have a weak spark or no spark, go ahead and buy and install a new coil. Start by removing the plastic engine cover and setting it aside. Then lift off the gas tank and remove any engine shields to access the ignition coil. Remove the old coil (**Photo 4**). Then install the new coil and set the air gap (**Photo 5**).

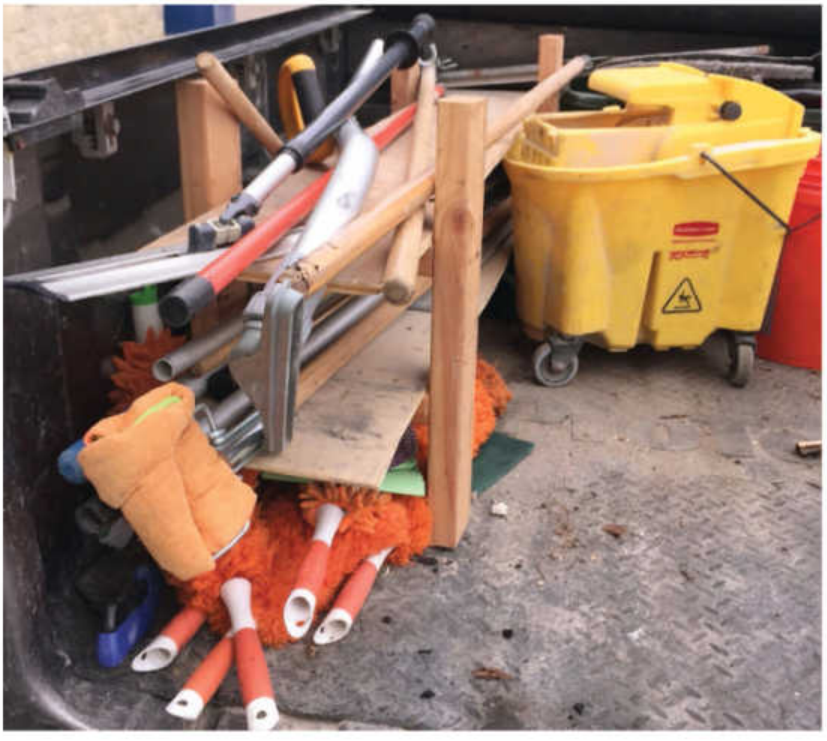
Replace a recoil starter

If the starter rope is broken, you can buy a recoil rebuild kit for about $15. The kit contains a new rope, dogs and dog springs. Setting the proper spring tension can be tricky, and if you get it wrong, you'll break the spring and have to replace the entire unit. Frankly, we recommend skipping the rebuild and just replacing the entire recoil assembly (**Photo 6**). It's much faster, and the complete assembly (about $40) includes a new housing and spring (set to the proper tension).

PRO talk

BY MARK PETERSEN editors@thefamilyhandyman.com

ART DIRECTION MARCIA ROEPKE • PHOTOGRAPHY HSP



NO MORE POLE DANCING

As a professional cleaner, I haul around a lot of long-handled tools: mops, vacuum wands, squeegee extensions, etc. When I was driving between jobs, all those poles would dance around and get tangled up, making it nearly impossible to pull out my other tools. My solution was to build a simple rack out of scrap 2x4s and plywood. It took me less than an hour to throw together and cost nothing. Now I just need a good system to keep my mop bucket from doing the tango back there.

Curtis Peterson

Run cords along the building

My first boss was always shouting at us, "Kick the cords against the building." It was a good habit to get into. Cords next to the building won't get tripped on, stomped into the mud or trapped under the next delivery of trusses. They'll also last longer if they're not always being walked on, rolled over with wheelbarrows or crushed by 10-ton telehandlers.

Josh Risberg, *TFH* Lead Carpenter

Got something for us?

If you have a tip, a brag photo or a project you'd like to share with fellow pros, send it to editors@thefamilyhandyman.com. We'll send you a $100 gift card for each one we publish.

Stand-up sawhorses

I like folding metal sawhorses. As a siding contractor, I owned a bunch of them. I always installed a 2x6 on the top as a sacrificial surface so I could cut on the sawhorses without damaging them or a saw blade. I cut the 2x6 about 1/2 in. longer than the horse, leaving 1/4 in. on each side. That way, they would stand up on their own.

At the end of the job, I'd fold in the legs on each one, stand them up, and then run around and grab two in each hand. They were also easier to store in the upright position in my shop and my trailer.

Mark Petersen, Associate Editor

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BY MARK PETERSEN editors@thefamilyhandyman.com

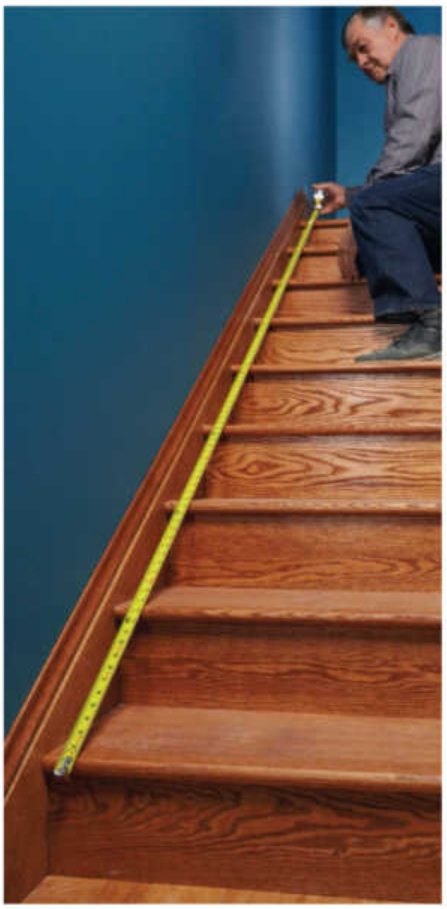
Rock-solid handrails

Handrails can prevent nasty tumbles down the stairs, so it's important that they be sturdy. Looking good is also important because of their prominent place in the house. We asked Jerome Worm, our favorite trim carpenter, for some tips on installing handrails. He demonstrated a fast and foolproof way to measure, showed us a great way to assemble the rail and specified what hardware he liked best and explained why. These tips will help you hang an attractive, rock-solid handrail that will last as long as the house.

MEET THE PRO

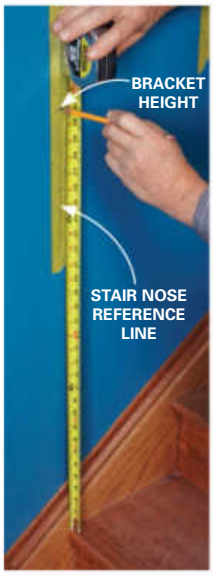
Jerome Worm has installed a couple miles of handrails in his 35-plus years as a trim carpenter.

ART DIRECTION VERN JOHNSON • PHOTOGRAPHY PAUL NELSON • CONSULTANT JEROME WORM



1. Measure from the bottom stair nose to the top stair nose

The handrail needs to run the entire length of the stairs to make sure it's safe and code compliant. The easiest way to determine that distance is to hook a tape measure onto the bottom stair nose and measure up to the top. Our expert prefers to add 6 in. to that measurement to provide a 3-in. buffer on each end.

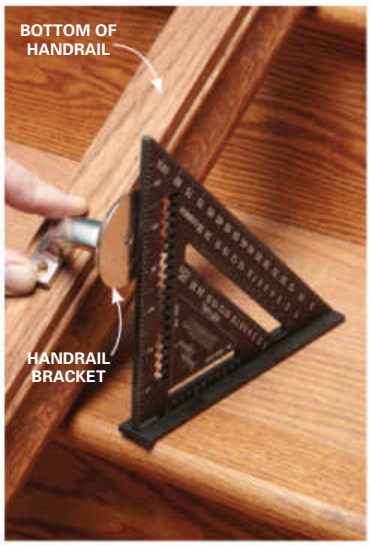


4. Mark the starting point and bracket height

Use a 4-ft. level to plumb up from the nose of the bottom step, and mark a vertical line on the wall. That line will indicate where the bottom end of the handrail should start. Next, measure up from the nose of the steps and mark an intersecting line representing the height of the bracket screw (see **Step 3**).

2. Mark the studs

Handrail brackets should be secured to the studs; drywall anchors aren't strong enough. These brackets need to be fastened a maximum of 48 in. apart, but check the specifications on the hardware you're using. Space the brackets 32 in. apart for round and oval handrails because they aren't as sturdy as the beefy, oak "bread loaf" style rail we're installing. Install a bracket on the studs closest to the top and bottom of the handrail. Mark the studs with painter's tape so you don't have to make pencil marks on the wall.



3. Find the bracket height with a carpenter's square

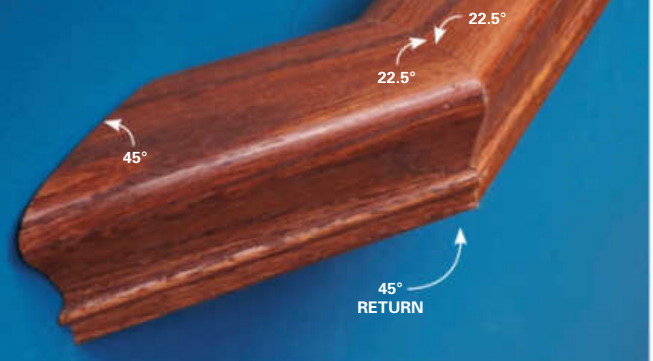
Mark the location of the bracket screw hole on the wall, *not* the top of the handrail. To find that measurement, set the handrail upside down on the stairs. Set a rafter square on a stair tread, right up to the edge of the stair nose. Next, set a bracket on the bottom of the rail where the screw hole lines up with the edge of the square. That dimension (5 in. in this case) is the distance you'll subtract from the desired height of the top of the handrail. We want the top of our handrail to be 36 in. high, so we'll make a mark on the wall 31 in. high.

5. Set other bracket locations with a square

Set a framing square on the skirt board, line it up with the mark indicating the bracket height, and note that number (see **Step 4**). Move the square up to the next stud that will support a bracket, and mark that number on the wall. If there's no skirt board, lay a 2x4 on the stairs and slide the framing square on that.

Avoid 90-degree returns

Handrails need to meet the wall (or a newel post) at each end. These "returns" alert people that the railing has ended. Returns also protect folks from bumping into a sharp edge of the rail. Jerome cuts his returns so they die into the wall at a 45-degree angle instead of a 90-degree angle. This method looks good and prevents clothing, purses and other items from getting hooked on the end of the rail.

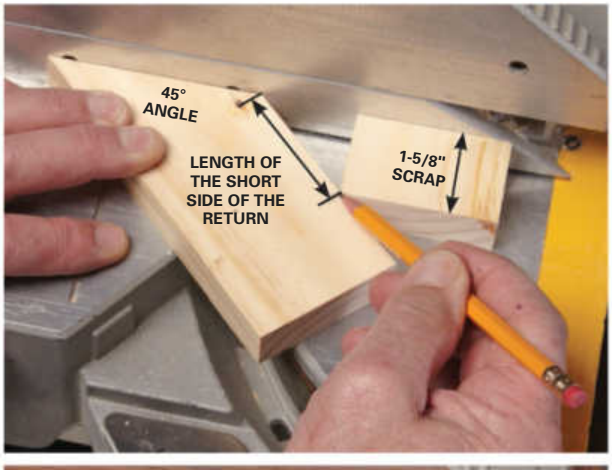


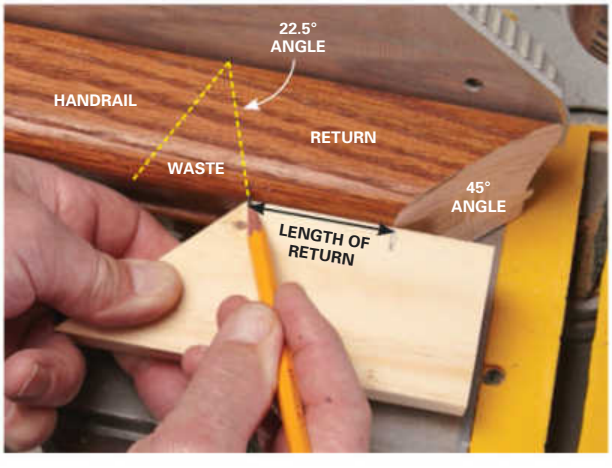
Cut with the 'show' side toward the fence

Miter saws cause wood to tear out and splinter more on the side that rests against the fence. This may sound counter-intuitive to you woodworkers, but when cutting handrail, it's better to have the tear-out occur on the "show" side of the rail, or the side that faces away from the wall. Tear-outs on the wall side of the rail will show up on the inside of the miter and are difficult to sand out. Rough wood on the outside of the miter can be sanded and rounded over much easier. Minimize tear-outs with a sharp blade and by cutting slowly and letting the blade stop spinning before raising it.

Find the length of the return with a block

Code requires a space that's at least 1-1/2 in. between the wall and the handrail. To find the length of the return piece, cut a 45-degree angle on a scrap of wood, and then cut a block of wood to the thickness of the desired gap between the wall and the railing (1-5/8 in. in this case). Place the 45-degree angle up against the fence and slide the 1-5/8-in. block up to that. Mark the point where the two intersect (**top photo**). That mark represents the short side of the handrail return. Transfer the mark onto the handrail (**bottom photo**). Cut the return off the same side of the rail where it will be installed. That way the wood grain will carry seamlessly through on the front of the railing.





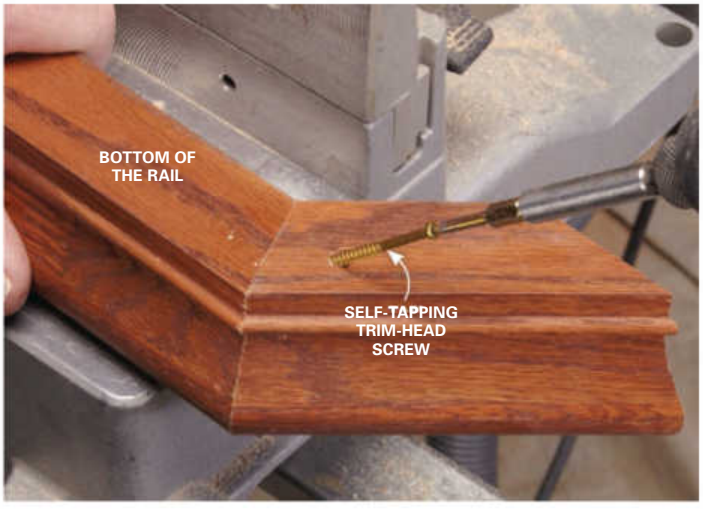
Building code requirements

- Handrails must run the entire length of the stair (bottom nose to top).
- The top of the rail should be between 34 in. and 38 in., measured directly up from the stair nosing.
- There needs to be at least 1-1/2 in. between the wall and the rail.
- Handrails must die into a wall or newel post.
- Circular handrails must have a diameter between 1-1/4 in. and 2 in.
- Custom shapes are acceptable but may have a specific size requirement (check with your building official).

Glue and pin returns

Glue and pin the return pieces before screwing them together. Line up the two glued ends as accurately as you can before pushing them together. If you move them around too much, the glue can act as a lubricant, making them difficult to hold in place when you pin them together.

Hold the pieces in place with a 23-gauge pinner while the glue dries. Pinners are nice because they don't leave a big, ugly hole, and the pins are less likely to follow the grain of the wood and veer off course like larger-gauge brads are prone to do.



Secure returns with trim-head screws

Let the glue set up for 15 minutes or so, and then strengthen the miter with a 2-1/2-in. screw driven in at the bottom. A self-tapping trim-head screw leaves a smaller hole and is less likely to split the wood. Regardless of the screw type you use, predrill a hole all the way through the first piece and about 1/2 in. or so into the second.

Choose single-hole brackets

The handrail brackets that have one screw hole are easier to attach than the brackets with three because the screw will still hit the stud if the stud line is a little off.

Use tape to align the handrail

Fasten the brackets to the wall, but leave them loose enough so you can twist them into perfect position with the rail. This rail runs 3 in. past the top and bottom stair nose. Our expert wrapped tape 3 in. up the bottom of the rail in order to line up the rail with the tape that represents the bottom stair nose. Predrill holes into the handrail for the bracket screws, and finish tightening the brackets to the wall after all the brackets are secured to the rail.

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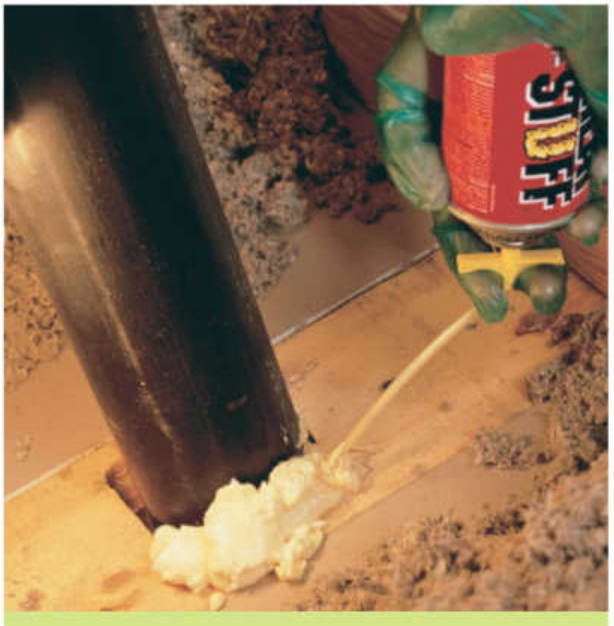
DIY Quiz Answers

1. (**A**) After the concrete is placed in the forms, the next step is to smooth the surface while forcing the aggregate slightly below the surface with a bull float. That leaves a thin layer of cement on the surface for final smoothing with a hand float and then a trowel.

2. False. First of all, used motor oil contains grit and acid, which can damage your chain saw bar, chain and drive sprocket. Second, used motor oil has a much thinner viscosity so it tends to get slung off rather than stay put and lubricate.

3. (**D**) The sash is the vinyl, aluminum or wood frame that contains the glass.

4. (**C**) Argon conducts about 67 percent less heat than ordinary air so it makes a window more energy efficient. Since argon is a noble gas, it exists as single atoms rather than molecules like oxygen and nitrogen. That means it's atomically smaller and actually *more* prone to leakage than ordinary air. Krypton is also used as a substitute for air. It's even more thermally efficient than argon but also costs more.



5. False. An attic bypass is any opening surrounding a ceiling or wall penetration that allows warm house air to escape into the attic. These can include holes that provide openings for vents, flues, electrical wires and electrical boxes. Using expanding foam is the easiest way to seal them.

6. (**B**) The single most important place is near sleeping areas. You're most vulnerable to CO poisoning while sleeping because when CO is present, your body can accumulate large amounts over several hours, killing you before you ever wake up. Putting CO alarms near gas-burning appliances or garages will trigger nuisance false alarms. By the way, carbon monoxide is deadly because it strongly binds to hemoglobin, which is the protein in your red blood cells that carries oxygen. Since CO supplants the oxygen molecules, oxygen deprivation is what actually kills you.

7. False. A pattern bit has a top bearing that follows a pattern you've already made. Use the pattern to trace the shape on each raw piece of wood, then rough-cut the shape slightly outside the line. Then pin or hot-glue the pattern to the roughed-out wood and use the pattern bit to make a perfect replica of the shape.

8. (**A** & **B**) Gasoline is a mixture of hydrocarbons, additives and blending agents. When the volatile components evaporate, the remaining fuel loses its ability to combust properly. And water will find its way into the fuel, especially if you have an ethanol blend. Ethanol attracts and holds water.

WHAT'S YOUR LEVEL OF EXPERTISE?

Beginner: 0 – 5 correct
Intermediate: 6 – 12 correct
DIY Guru: 13 – 15 correct

9. (**D**) When that spaghetti sauce boiled over, it coated the igniter with gunk, so the spark won't fire anymore. Clean it off with a toothbrush.

10. False. Wherever you live in the United States, dial 811 to have all your underground utilities marked.

11. True (usually). The clippings are a good source of nutrients as they decompose, and they also provide mulch to keep moisture in the ground. If you've let your grass grow too long, however, don't just mow it at the normal cutting height. The long cuttings will smother the lawn. Instead, just mow 1 in. at a time (or no more than one-third of the total length), with a couple of days between mowings.

13. (**D**) A length of custom post-formed countertop likely won't fit between two walls without damaging the walls or the countertop. So cut a little clearance hole just barely above the top surface to you can work it into the space. Then you can scribe the other end to fit.

14. (**C**) Self-leveling compound is used to protect in-floor heating elements and level uneven floors. It's also a good base for ceramic tile floors.

15. False. Unlike extension cords, plug cables are made of delicate carbon fibers. Over time they break down, causing high resistance, which degrades the spark. That results in poor combustion, misfires and lousy gas mileage. Replace cables between 60,000 and 100,000 miles or the interval given in your owner's manual.

12. (**D**) Using the fence for crosscutting is extremely dangerous. The board is very likely to get bound between the blade and the fence and get violently thrown back at you. But you can use the fence to replicate many identical cuts if you simply clamp a short block to the fence. That way the board you're cutting will never become trapped by the blade and fence.

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ALL SHOOK UP

My wife asked me to touch up some paint in our kitchen, so I went down to the basement to grab a paintbrush. During that time, my helpful wife pried open the lid on the paint can and left it sitting loosely on top. When I returned from the basement, I picked up the can and shook it vigorously, sending paint flying all over the place. My wife wasn't pleased, but it sure worked faster than using a paintbrush!

Dave Farrand

Look out below!

I was afraid of falling off my roof while painting a dormer, so I went to the back of the house, tied a rope around a large pine tree, tied the other end around my waist and climbed to the roof.

Just before I lowered myself toward the dormer, I heard a child's voice in the distance. I paused, walked to the edge of the roof in the back and saw that my 7-year-old son had untied the rope from the tree and wrapped it around his waist. He proudly looked up and said, "I've got you, Dad!"

Luckily, I was able to climb down and explain to him that this arrangement would not work. Then I retied the rope to the tree and asked my wife to guard it—and my safety.

Paul Roeber

Editor's Note: A rope around your waist isn't a safe way to prevent a fall. Always use safety equipment that's designed for the job, such as roof brackets and a personal fall arrest system (also called a roof harness).

Basketball court foul

The basketball court in our backyard had seen better days, so my dad and I decided to try to clean it. We bought a used pressure washer, which worked great at first, blasting decades' worth of muck from the court's concrete surface. But after a few minutes, the pressure washer stopped working. We were so sure it was something mechanical that we tore the whole thing apart, stem to stern.

It was hours later when I finally thought about checking the wand. I removed the tip only to discover that a tiny pebble had somehow lodged in the pinhole-size opening. It took me about 10 seconds to clear the tip and several hours to put the pressure washer back together.

Joe Bosseler

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